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NEWSPAPER

The Burroughs B80 features a double-sided floppy disk drive which may prove two heads are better than one.

Burroughs Introduces B80 With Double-Sided Floppy

By Esther Surden
Of the CW Staff

DETROIT – The B80 from Burroughs Corp. is a small general-purpose system primarily designed for business applications and featuring a double-sided floppy disk as storage media.

The B80 is the first in a series of modular systems slated to be introduced in the near future, Burroughs said.

The "super minidisk" is a flexible media capable of storing 1M bytes of data with an average random-access time of 266 msec, Burroughs said.

The floppy's increased byte capacity was attributed to a combination of higher density recording and recording on both sides of the disk.

Two floppies are housed vertically in the B80 cabinet; each drive has two heads to access both floppy sides, a spokesman said.

The B80 system, which Burroughs said is cost-effective for large organizations with branches that wish to place computing power where management information is required, can also be used by first-time users who wish to upgrade from a less advanced system.

Burroughs B700 RPG and Cobol programs are source code-compatible with the B80 and may be recompiled and used on the system, the firm said.

Computer Management System (CMS) software, introduced for the B80, is an integrated system of operating and application software, Burroughs said, designed for modularity.

Elements of CMS

Included in CMS is the Master Control Program (MCP); RPG and Cobol compilers for applications programs; data communications, interpreters and utility programs; the Burroughs Data Base Bridging System and the Burroughs Business Management System (BMS) application program products, the firm said.

The MCP allows additional peripherals, applications, I/O devices and communications units to be added to the system without any reprogramming, Burroughs said.

The microprogrammed central processor for the B80 consists of small read-only "nano" memory, a micro stack, I/O logic and system registers contained on nine LSI circuits on a single printed circuit board, Burroughs said. The processor operates at 1 million cycle/sec, it added.

The B80's MOS main memory has a 1 µsec access time and is expandable from 32K bytes to 61K bytes in 4K-byte increments, the firm said. The remaining 3K of memory is reserved for cold starts and maintenance testing, the spokesman said.

The system is capable of communicating either asynchronously or synchronously at speeds from 75 bit/sec to 9,600 bit/sec over leased, switched or direct connect lines, Burroughs said. Burroughs Data Link Control (BDLC) procedure and the Network Definition Language (NDL) compiler for implementing or reconfiguring a network can be used.

The Message Processing Language compiler provides a method to interface between NDL and the user program, Burroughs said.

(Continued on Page 8)

The Criterion series with single bus design, introduced by NCR, signals an architectural departure for the firm. Pictured above is the 8550 with operator console, card reader, disk units and line printer.

Series of Modular Systems

NCR Criterion Features Single Bus Design

By Esther Surden
Of the CW Staff

DAYTON, Ohio – The NCR Corp. Criterion series of medium- and large-scale systems introduced here last week features single bus architecture and modular design.

The systems, which represent an architectural departure for NCR, are said to be object code-compatible with the more powerful members of the firm's Century series they are meant to replace.

Century users can bring their peripherals with them to the Criterion series, a spokesman added.

Designed for telecommunications, data base and distributed processing applications, the Criterion 8550 and 8570 provide about 35% more processing power at less cost than comparable IBM 370/115 and 370/135 systems, the spokesman said.

An 8550 processor with 128K of memory costs $107,400, NCR said. A comparable 370/115 costs $176,050, according to an IBM spokesman.

The 8570 processor with 256K bytes of memory costs $282,700, according to NCR, while a comparable 370/135 costs $466,500, IBM said. The prices cover the cost of the CPU only.

Model Differences

The primary difference between the two Criterion models are processor cycle time and the maximum amount of main memory that can be accommodated.

The 8550 has a 112 nsec cycle time and can handle up to 512K bytes of error-correcting MOS main memory in 64K-byte increments; the 8570 is faster, with a 56 nsec cycle time, and has a 1M maximum error-corrective MOS memory in 128K-byte increments, the firm said.

Transfer Bus at Center

The systems were designed around an internal transfer bus. Circuit boards – which contain the CPU, up to two minicomputer disk controllers, a maximum of four microprocessor-based communications controllers, I/O trunks and a dedicated service processor for diagnostic control – plug into the bus, the spokesman said.

The power supply and cooling unit are also contained in the Criterion "box."

An important Criterion feature is the system's flexibility, NCR said. Firmware resident in 256 bytes of flexible disk can be loaded into the internal storage unit to enable the Criterion to present itself to users as though it were a Cobol virtual machine, multiprogramming system or NCR Century system, the firm said.

Other Criterion system features include:

(Continued on Page 8)

Handles 12 Concurrent Tasks

'DOS/MVT' Dynamically Uses Memory Regions

By Don Leavitt
Of the CW Staff

MILL VALLEY, Calif. – The DOS/MVT operating system from Software Pursuits, Inc. (SPI) allows IBM 360/370 installations now under DOS to break away from fixed memory partitions and replace them with dynamically allocated regions similar to those long available under OS, the vendor said.

As many as 12 batch regions can be controlled concurrently under this system, a spokesman claimed.

Described as a "total rewrite" of IBM's software, DOS/MVT is nonetheless "fully compatible" with DOS Release 26 – the last IBM release for the 360 – and user programs can run under the SPI system "without modification," he continued.

The package "supplies nearly all system features of all other vendors [of DOS enhancements] combined," the company stated.

The software is limited, however, only to the larger installations since user sites must have at least 192K bytes of main memory.

DOS/MVT facilities "always" provide "at least a 20% improvement" in throughput over competitive systems and "frequently permit a 100% improvement," the vendor claimed.

Regions Stay Same

All regions are functionally the same to the DOS/MVT user. Each region is capable of executing any program, and all system and private libraries can be shared by all regions and by multiple CPUs, according to SPI.

DOS/MVT is capable of loading and executing programs link-edited with common self-relocation systems or with a system built into the SPI software. "Blocked Fetch" loading is available, but memory-resident directories and programs can also be used, the spokesman added.

Reentrant programs – a single copy of the code executed by several users simultaneously – is supported under DOS/MVT, he said. So are concatenated or linked Core-image libraries, providing more effective facilities for locating a program, he explained.

A multipath channel scheduler allows I/O devices to be connected to "any number" of selector channels, permitting many configurations "never before possible," and generally improving channel and device utilization, he said.

Main tasks and subtasks are each cap-

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Mass. Welfare Department Hires DPers To Pinpoint Cheaters by Matching Lists

By Nancy French
Of the CW Staff

BOSTON – The Massachusetts Department of Public Welfare has hired a specialized DP service group here to help match 6 million personal records this year in an effort to spot welfare cheaters.

The program is expected to reduce overpayments and eliminate payments to ineligible recipients – errors that now cost the state an estimated $7 million to $10 million a year, according to Commissioner Alexander Sharp who heads the welfare department.

Besides assuring no recipients are illegally receiving more than one type of public assistance, the program is expected to provide fraud safeguards and ultimately increase child support revenues, according to Sharp.

Urban Data Processing, Inc. (UDP) of Burlington, Mass., won the competition for a one-year $184,000 contract that involves combining lists of recipients of Aid to Families with Dependent Children, General Relief, Food Stamp and Medicaid with information contained in the files of other state agencies.

But combining a couple of mailing lists with different structures and formats for name and address files is no easy task.

UDP will do the job by first "normalizing or standardizing the formats as well as the components within each field on every agency's list of recipients, Max Eveleth Jr., UDP president, explained.

Using proprietary software systems known as the Street Address Matching System (Sams) and the Customer Information System (CIS), UDP will disaggregate each original record furnished by the state. UDP's software is based on pattern recognition and table lookup techniques, he said.

Record Creation

New records, organized by name, street address, city, state, Zip Code and file source code will be created. The records will also contain other variable data that in some cases includes Social Security number; however, the Social Security number will not be used as a key in matching, he emphasized.

UDP's programs were originally developed for use by banks that wanted to get a thorough picture of their customer's accounts and dealings with the institution, to see what other services each customer could be encouraged to utilize, he explained.

The state will furnish the lists on magnetic tape; processing will be done at UDP; and the names, matched in accordance with welfare department's predetermined criteria, will be returned to state personnel, ready for printing, according to Harry Kreide, project manager in the welfare department's DP center.

Specialists will determine whether certain records are simply duplicates, whether the address data is incorrect or out of date, or whether in fact the recipient appears to be cheating, Kreide said.

If evidence of cheating is found, caseworkers will follow up with an investigation of the case involved.

Privacy Assurances

To assure the privacy of recipients, no printing will be done by the contractor, Kreide said.

In addition, UDP will be bound by all the privacy regulations and standards that govern the welfare department itself, and these will be specified in the contract, he added.

In addition to matching the files, UDP will help the Department of Public Welfare convert the software so that, by the end of the one-year contract, the programs can be run on the department's internal system.

The software was written for use on an IBM 370/158, running under OS/VS, whereas the state uses an IBM 370/145 running under DOS.

Fifty percent of the cost will be reimbursed by the Federal government, according to Sharp.

The new matching system is expected to be a great improvement over methods used previously which were limited primarily to cross-checking Social Security numbers, Kreide indicated.

Mini Aids 'Home of Gods' Study

WALTHAM, Mass. – "The place the gods call home," an ancient city northeast of Mexico City, is being studied for answers about its lifestyle and civilization with the help of a minicomputer.

Geroge Cowgill, professor at Brandeis University here, is in charge of the investigation to discover what kind of people lived in pre-Columbian city called Teotihuacan.

While identification of the more than one million artifacts found in the city has been done manually, a Digital Equipment Corp. Decsystem-10 is being used for discriminant and factor analysis as well as data storage and retrieval, Cowgill said.

The data is grouped in categories and then correlated. Correlations are made for each artifact in reference to the neighborhood in which it was found and the kinds of people who used it.

Computer graphics are used to make maps of the distribution of artifacts across the city in the research effort, which is supported by grants from the National Science Foundation.

The data is compiled from examining different areas of the city and the various classes existing in the society.

By discovering what types of people used what type of things, a pattern of the culture and lifestyle of the people is being pieced together, Cowgill said.

CW Sister Born in South America

RIO DE JANEIRO, Brazil – A biweekly newspaper, *DataNews*, has started publishing here.

The newspaper, a sister publication of *Computerworld*, is oriented to the DP user and features a range of product announcements and articles on various issues affecting the DP community.

The paper is written in Portuguese and includes one page in English of either an entire article or summaries of several items.

Donald M. Best is editor, headquartered at Av. Rio Branco 156/Sala 1222, Rio de Janeiro ZC-21.

DataNews is published by Computerworld do Brasil, Servico e Publicacoes, Ltda. and has staff both here and in Sao Paulo.

There are currently 7,000 subscribers. The annual rate for an airmail subscription outside of Brazil is $50. For delivery within Brazil, the annual rate is 250,000 cruzeiros.

Six-month subscriptions are available at $25 and 125,000 cruzeiros.

DataNews appears the first and third Mondays of each month. Other publications in the *Computerworld* family include *Shukan Computer* in Japan and *Computerwoche* in West Germany.

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Chairman Cites Recent Decisions

AT&T Charges FCC With Risking Phone Net's Integrity

By Ronald A. Frank

Of the CW Staff

PHILADELPHIA – Recent decisions by the Federal Communications Commission (FCC) have threatened the technical integrity of the telephone network and will ultimately lead to higher costs for home telephone users, according to John deButts, AT&T chairman.

Speaking at the AT&T annual meeting recently, deButts defended Bell's proposed congressional legislation as an attempt to apply "public interest standards to regulatory decisions as to where competition should apply and where it should not."

The bill, known as the Consumer Communications Reform Act of 1976, would amend the Communications Act of 1934 under which the FCC operates [CW, March 22].

"The telephone industry is not asking Congress to choose between monopoly and competition in the supply of communications services in this country," he said.

DeButts charged that recent FCC decisions jeopardize the quality of phone service "by encouraging wasteful duplication of facilities, add unnecessary costs to the nation's phone bill and, by forcing basic phone rates up, they restrict [service] availability."

The FCC, through recent decisions, has taken issue with the basic principle that the telephone network "is a major national resource that needs to be carefully guarded," he said.

The FCC decision establishing the specialized carriers allowed parallel facilities to be built alongside phone company equipment "without sharing [Bell's] obligation to serve all routes," deButts said.

The FCC also required AT&T to provide facilities to "these same competitors that enable them to provide their customers [with] direct access to the switched [phone] network," he added.

The FCC ruled in March "that the telephone companies, which have historically been held accountable for the quality of their service from end to end, must now permit direct connection to the network – that is, without any intervening protective device – of customer-provided telephones. . .and other terminal equipment which, having no responsibility for them, the telephone companies cannot assure will be properly installed or adequately maintained," he said.

"These developments seriously threaten the technical integrity of the network and compromise our ability to plan it as a whole," deButts told the stockholders.

Already Creating Problems

"Already [the FCC decisions] have begun to create difficult and expensive problems of accommodation as we are required to mate our facilities to those of competitors with different design standards, different operating methods, different maintenance procedures," deButts said.

"Already they have begun to complicate the task of network planning, requiring us to cope as best we can with the imbalances that arise when competitors use our facilities to optimize results for *their* customers without regard to the impact of their doing so on *all* customers," he said.

"And already we can see that the FCC's brand of competition, instead of spurring innovation, will impede it.

"It will impede it by dividing among two or more carriers traffic that could more economically be handled by one and that, if it were, might sooner warrant investment in the higher capacity transmission systems that would mean lower unit costs for everybody.

"And already we can see, as more and more hardware over which we have no responsibility is hung on the ends of our lines, the prospect of more and more hassles over whose fault it is when things go wrong, whose responsiblity it is to fix it and who will pay for the fixing."

The FCC actions have created not competition but regulated competition, "a bureaucratically administered allocation of the market. In the terminal area we are regulated, but our so-called competitors are not. . .[they] are free to write their own price tags." deButts said.

"This isn't true competition. It is rigged competition," deButts charged.

"I hope you will write your senators and congressmen. . .and tell them what you think," deButts told the meeting.

NRMA Meeting to Consider Impact of Privacy Laws

NEW YORK – The National Retail Merchants Association (NRMA) will consider how privacy laws will affect retailing and other industries at a national conference here May 24-25.

Participants will include David F. Linowes, chairman of the Privacy Protection Study Commission; Ronald Plesser, the commission's general counsel; and Ruth Davis, director of computer sciences and technology for the Commerce Department's National Bureau of Standards.

Further information and registration can be obtained through Privacy Conference, NRMA, 100 W. 31st St., New York, N.Y. 10001.

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Less Stringent Privacy Regulations for States Urged

By Nancy French
Of the CW Staff

SAN FRANCISCO – Privacy regulations – especially where information transfer is concerned – should be less stringent for states than for the Federal government.

Without the current information-sharing privileges, much of the work done by state agencies would come to a halt, according to John Lautsch, an attorney for the California State Universities system.

Lautsch pointed out that law enforcement agencies, for example, presently depend upon other operating agencies to inform them of violations.

The Department of Motor Vehicles alerts police when autos are stolen, and the Fish and Game Department contacts police about violations of fish and game rules, he noted.

Franchise tax boards tell law enforcement officials when tax statutes have been violated, he added.

"Modifying information transference in state governments without carefully considering the impact of the modification could have profound collateral effects on the operation of these types of agencies," he told attendees of the Computer Law Association's recent conference here.

State governments' use of personal information is more like that of American businesses than that of the Federal government, Lautsch explained.

State governments use automated personal information systems for on-line business operations such as licensing drivers or computing unemployment insurance benefits.

The Federal government, on the other hand, tends to use large-scale information programs to generate statistical information such as that used for policymaking by the Internal Revenue Service and the Social Security Administration, Lautsch said.

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There is no doubt the public wants to see computerized information systems regulated, Lautsch said, noting that as early as 1972 California voters amended that state's constitution by popular referendum, elevating privacy to the status of a fundamental right.

The amendment, which focused exclusively on computerized information systems, said in part that "modern technology is capable of monitoring, centralizing and computerizing information which eliminates any possibility of individual privacy."

But laws modeled after the Privacy Act of 1974 are not the answer. "Already seven states have enacted some type of fair information practices statutes," he said, adding that 23 states have enacted laws regulating electronic funds transfer (EFT) systems.

In their haste, many legislators are making mistakes, he claimed.

Most are concerned with regulating the nature of the "gadgetry, the security arrangements, and establishing consumer rights," he said. Many enactments treat EFT systems as a "banking" phenomenon, and legislation is primarily aimed at amending branch banking laws, empowering the state superintendents of banking to prohibit operating EFT terminals except on conditions established by the superintendent, he said.

"But EFT has implications far beyond mere banking," he warned. Retail chains are extensively involved in extending credit to their customers through check cashing and credit cards.

Western Union and the U.S. Postal Service offer money by wire and money orders services, a type of fund transfer system that could be upgraded into an EFT system, he said.

"Would upgrades to EFT systems by the Postal Service and Western Union need to be approved under the regulation of the state superintendent of banking?" he asked.

Finally, most privacy regulations incorporate a means of allowing individuals to ascertain what personal information state agencies possess about them and the right to contest and amend that data.

The administrative impact of these provisions could have a devastating effect on an agency's organizational structure, Lautsch said.

Privacy Law Called Dangerous For Private-Sector Companies

By Nancy French
Of the CW Staff

SAN FRANCISCO – Omnibus legislation covering information-handling practices in the private sector is the most dangerous legislation private-sector organizations have ever had to face, according to William A. Fenwick, an attorney with Davis, Stafford, Kellman and Fenwick.

Many privacy proposals that will be voted on this year could paralyze business activities by interfering with established patterns of problem solving, he said at a meeting of the Computer Law Association here recently.

"Information gathering is a basic process of the continuation of civilization," he said.

Over the years many serious crises have been solved using information that originally had been gathered for other purposes, but most omnibus privacy laws would prohibit using information in this way, he said.

In addition, many of the state privacy bills, if passed, would slow down the already-cumbersome judicial process, he said.

While the Privacy Act of 1974 exempts lawyers seeking information for litigation, most state laws do not, he noted, adding

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When Crossing Borders

Laws Often a Factor in Net Decisions

By Nanch French
Of the CW Staff

SAN FRANCISCO – The user setting up a communications network that crosses state and national boundaries faces many tax and communications laws that make some of his equipment and procedural decisions for him, according to Landon Miller, DP manager for Nordstrom, Inc., a West Coast department store chain.

Laws have become so complicated that he has begun to work for a law degree, he told members of the Computer Law Association, who met here recently.

Nordstrom's communications network, established largely to authorize customer credit at some 600 point-of-sale terminals, faces tax challenges from the statc of California, Orange County and the Canadian government, he said.

Its central DP installation in Seattle consists of an NCR 251 with 384K, front ended by a 48K NCR 725.

Reports were previously printed in Seattle and shipped in hard copy form over the border to Vancouver, he said. Now, howcver, the Canadian government treats print-outs as imports, for tax reasons, so Nordstrom's installed a printer in Vancouver and began sending the data over a leased line.

Now the Canadians are threatening to tax the data moving on the network, he said.

Another tax problem brewing in Orange County, he said, is taxation of software at market value – much like hardware is taxed, he said.

"Although we haven't any stores in Orange County at present, this could be a problem for us next year," he said.

"We would be using the same software in Orange County as we do in Portland," for example, he said, and our software actually resides in Portland.

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The software would be in Orange County in the form of electronic impulses when the system is live during the day. However, when the system shuts down at night, it would disappear, he said. "What are they going to tax?" he asked.

Postal Regulations Pose Problems

Federal Postal regulations pose still more problems for Nordstrom's.

"Users can batch transmit data without violating postal regulations as long as the data is processed within 36 hours," he said, adding that presumably Postal Service delivery couldn't match this.

However, the user who doesn't process the data within that time period would be violating postal regulations 510 and 520, he said, and would be subject to postal charges. The details of these charges have not yet been worked out, however.

A California state law that forbids users chargeback for DP service has already caused Nordstrom's accounting problems, he said.

The state argues that DP services are taxable because the central DP department is providing service that otherwise would be purchased from an outside supplier, he said.

Nordstrom's, which has an electronic funds transfer (EFT) system by virtue of its point-of-sale terminals, could also be affected by proposed EFT regulations, he said.

Besides the NCR mainframe and front end in Seattle, the network consists of NCR 725 minicomputers in Anchorage, Alaska; Tacoma, Wash.; and San Francisco to serve stores in those areas.

The point-of-sale terminals are NCR 280-120s, he said.

Privacy Act Seen as Dangerous

(Continued from Page 4)

that "people are going to be pretty reluctant to talk to lawyers without a subpoena if by doing so they may be risking a year in jail or a $5,000 fine," he said.

"More injustice will be done using privacy as a justification than anything we have yet dreamed about," he said.

Today's emphasis on privacy is ironic, according to Fenwick, in light of society's history of dependence upon the scientific method and problem solving by gathering as much information as possible on a subject.

"We've made information a 'holy' subject," he said. "Society can't function without it."

The themes common to most privacy bills are the public notice, access and dissemination requirement and the prohibition on the use of a universal identifier, he said.

"Personal information has been defined as information about a person's finances, education, religion, health or anything done by or to that individual," Fenwick said.

Further, most bills call for a company to publicize the existence of files by mailing notices to data subjects and publishing the existence of the files in the local newspapers. "A company like General Motors would have to buy an awful lot of space to meet that requirement," he said.

As for the transfer of dissemination requirement, most bills deal with two types: routine dissemination and nonroutine dissemination.

Records of routine information transfers would not be required, he said, but detailed audit trails would have to be kept if anyone else sees such information.

"What a nightmare," he said. "The access record now becomes a personal record about the individual who saw the other individual's file and this record must be similarly protected," ad infinitum.

The laws also require companies to give people access to information about themselves, but how does a firm do that?

If people have the right to inspect their records, members of a dissident organization could come in asking to inspect their records and shut down the whole business, he said.

Finally, he said, it is the universal identifier that enables a recordkeeper to assemble the various parts of a record on individuals. If universal identifiers are prohibited, how can a recordkeeper provide an individual with a complete copy of his record? Fenwick asked.

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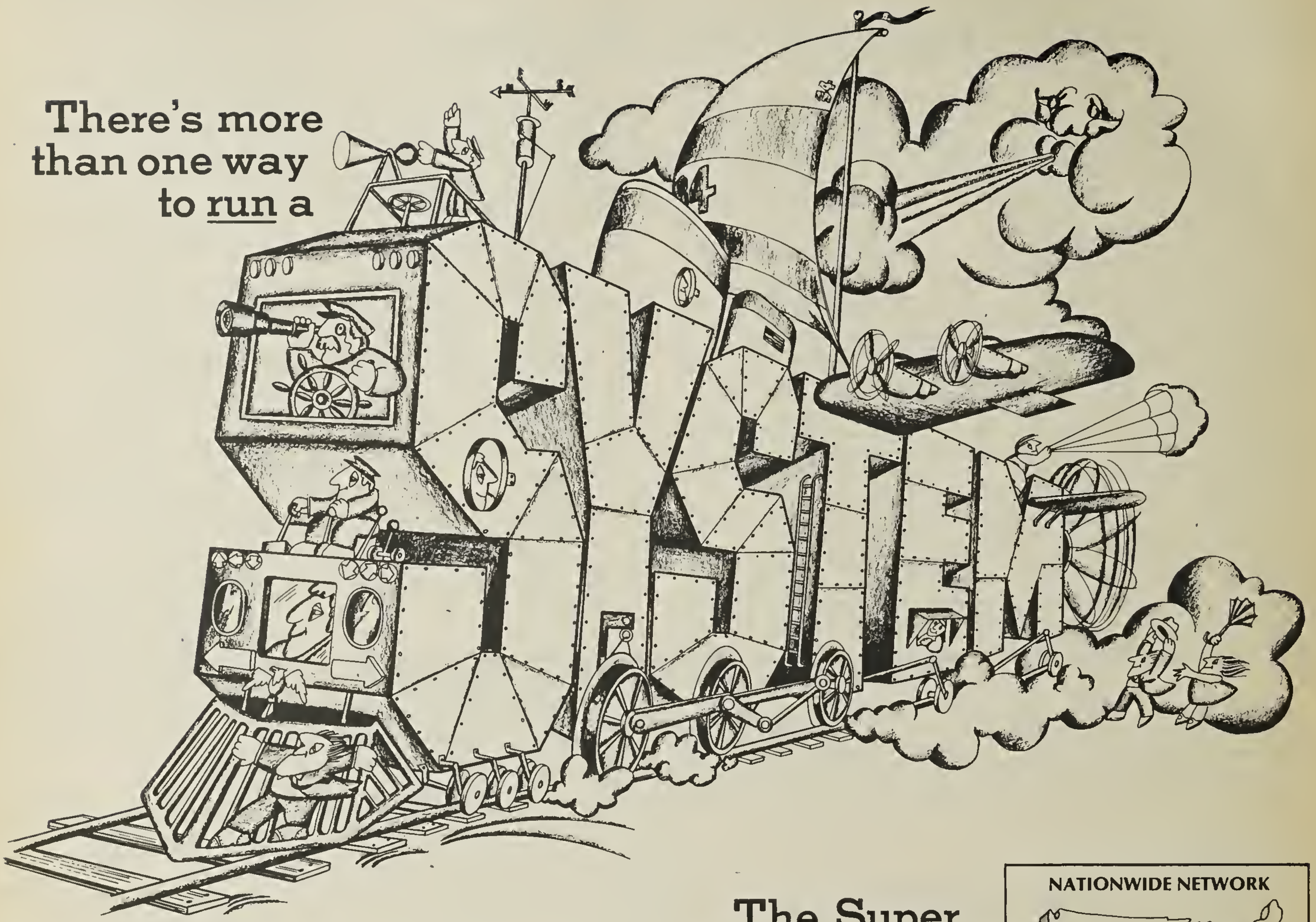

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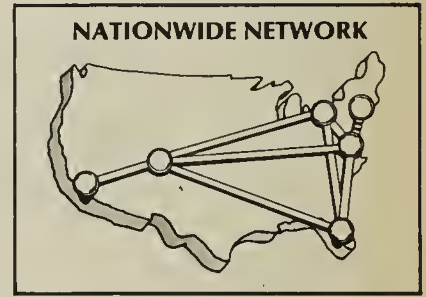

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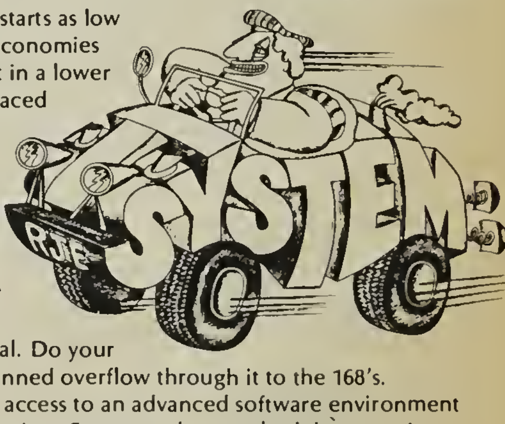

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If you've got something like a 370/135, that makes a fine terminal. Do your routine work on it and channel planned overflow through it to the 168's.

The overflow may be to gain access to an advanced software environment as much as to relieve capacity constraints. For example, you don't have to give up a written-down #360 just to get 15 minutes of IMS per week.

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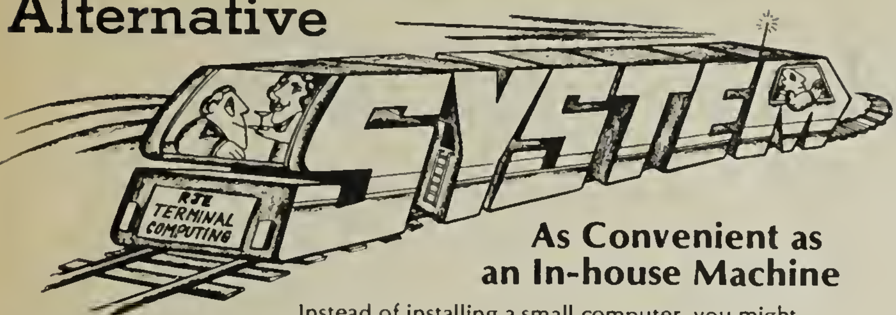

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Instead of installing a small computer, you might consider one of our Remote Job Entry Terminals as an **alternative.** The cost will be about the same.

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RJE Terminal Computing gives you virtually unlimited capacity and configuration, powerful programming languages and technical environment and unrestricted access to off-the- shelf business systems software (which isn't often suitable for use on smaller machines).

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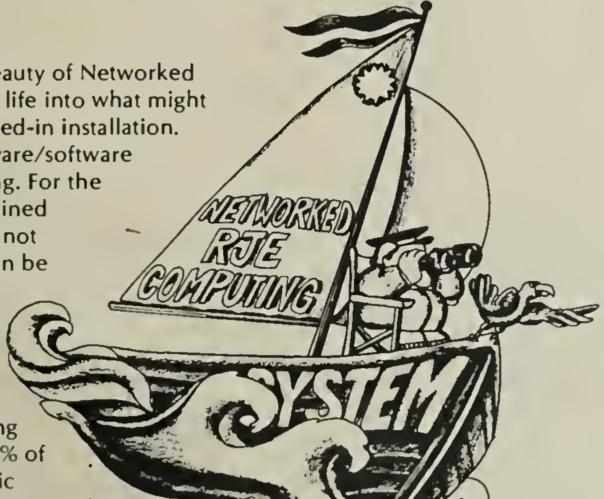

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The beauty of Networked RJE Computing is that you put new life into what might have been an under-financed, locked-in installation.

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Burroughs B80 Debuts With Two-Sided Floppy

(Continued from Page 1)

TD 700 and TD 800 input and display terminals provide data entry and inquiry capabilities for on-line communications, the firm said.

Besides the "super minidisks," up to six of which can be used on a B80, the system can accommodate disk cartridge drives with up to 27.6M bytes of data on-line. Industry-compatible minidisks and magnetic tape can also be used with the system, Burroughs added.

Printer Introduced

A 180 char./sec console matrix printer was introduced with the B80 system. Users can also choose to use a 60 char./sec console matrix printer and up to two line printers with 160- and 250 line/min speeds respectively with the B80, Burroughs said.

The B80 can have up to 11 controls for handling I/O devices, the firm noted, four of which are reserved for data communications. An automatic hardware interrupt system allows each I/O channel to notify the processor when data is ready to be processed so the processor does not need to continuously scan the channels.

When programs are to be executed, the MCP brings the interpreter, an organized group of microinstructions, into memory; individual interpreters serve the individual needs of each language, Burroughs said, so the B80, in effect, alters its logic for each language.

The MCP also supervises virtual memory capabilities and multiprogramming. Under virtual memory, only program segments needed for program execution are brought into main memory, enabling the B80 to execute a program that is larger than the operating system, the firm said.

The Data Base Bridging System "automates" the transfer of data bases from other small systems, including the B700, to the B80 using magnetic tape cassette.

BMS application programs introduced for the B700 and Burroughs L series are available for the B80, Burroughs noted.

A Commercial BMS II package for accounting applications, introduced with the B80, costs $4,000 with a monthly license fee of $200, the firm said.

A basic B80 system for $19,510 includes 32K of memory, two floppy disks with 1M bytes each, a 60 char./sec printer, one cassette drive and a system display. The system leases for $618/mo.

System software starts at $2,500, the spokesman added. Prices can range up to $150,270. Burroughs said from Detroit, Mich. 48232.

NCR Criterion Series Marks Architectural Departure

(Continued from Page 1)

- The use of fast emitter-coupled logic circuitry.
- A "pipeline" processor that performs fetch, interpret and execute functions simultaneously.
- A dedicated service processor which acts as a control center over three levels of diagnostics to check components and isolate malfunctions. A log that registers the last 16 transactions processed can be accessed remotely, the spokesman said.
- Up to 16M bytes of virtual memory per program.
- On-line program development.
- A high-speed direct memory access (DMA) trunk that plugs directly into the bus.

Criterion Software

Software for the Criterion systems includes a Cobol compiler. The Criterion Real Storage Software operating system provides for batch, on-line and multiprogramming executives.

A Virtual Resources Executive required for a virtual Criterion configuration will be available in mid-1977 and will feature virtual storage, a file access method and the Cobol virtual machine, NCR said.

Neat/3, Fortran, RPG and Basic, formerly available with the Century series, are also available for the Criterion systems, the vendor said.

Peripherals can include card readers and punches, line printers, paper tape readers and punches, a magnetic ink character recognition (Micr) sorter/reader, matrix printers and thermal printers.

Retail, commercial and financial terminals and CRTs can communicate with the system, NCR said.

Disk units with up to 200M byte/unit and an 806K-byte with transfer rate and a data module introduced with the Criterion models with up to 70M bytes of storage as well as magnetic tape can be used as storage media, the firm added.

A basic 8550 with 128K memory, 112 nsec processor, integrated 600 card/sec reader, 1,200 line/min printer and 200M-byte disk unit costs $258,950 or $5,900/mo under a five-year agreement.

The 8570 with 256K bytes of memory and a 56 nsec processor, 600 card/min reader, 1,200 line/min printer and 300M bytes of disk costs $458,250 or $10,300/mo on the five-year plan from the firm in Dayton, Ohio 45479.

'DOS/MVT' Can Handle 12 Tasks

(Continued from Page 1)

able of the same functions under DOS/MVT. Subtasks may, for example, attach other subtasks, use the time freely and use unique console prefixes to allow message identification. Subtasks may be canceled using the console identification or the subtask name, the spokesman said.

To aid in system reliability, many "hard wait" conditions – including CPU checks and fetch errors if they are recoverable – are eliminated, he went on. A stand-alone dump copies all memory to tape and restarts the system without an Initial Program Load (IPL), he said.

Communications Eased

Communications between the operator and the system have been both simplified and improved, SPI claimed. Information can be passed to a program, for example, via an OS-compatible PARM facility without having to read control cards, the spokesman added.

An automatic task balancing facility adjusts internal priorities to the current workload. Looping programs do not affect this mechanism, since time-slicing is employed, he said.

A routine called Sage spools reader, printer and punch I/O for all 12 regions and jobs may be scheduled by priority within job class while each region may select its work from multiple classes.

Reports run through Sage may be printed in the conventional chronological order or grouped together and printed in customer, department or other sequence, he added.

DOS/MVT is only offered on a month-to-month basis for $500/mo. Although no discount is allowed for multiple sites, a 40% discount is available for multiple CPUs at the same location, the vendor noted.

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ACM Report Urges 10 Privacy Principles for Data Banks

By Naney French
Of the CW Staff

LOS ANGELES – Just as the individual has a right to privacy, so does society have a right to information – but personal information systems should adhere to 10 basic principles, according to a recent report published by the Association for Computing Machinery's (ACM) Los Angeles chapter.

The report was based on studies of information-processing activities in the state of California, the Chapter's Ombudsman Committee on Privacy said, but noted its recommendations were not addressed strictly to government users.

No information system containing personally identifiable data whose existence is unknown to the data subject should be permitted, according to the report.

Individuals should be able to find out what information is stored about them and how it is used, the report said.

One-Time Mailing

Suggesting a one-time mailing to each data subject describing the purpose of the data bank as well as the amount and nature of the information maintained, the report said this information could then be followed by an annual announcement in the local media.

The report also recommended that personally identifiable data not be collected unless the information system is safeguarded by a level of security commensurate with the sensitivity of the information.

While it is unreasonable to expect every organization to comply with a universal standard, each firm should establish a security policy that has the full commitment of management and the support of every employee. Further, it should be constantly monitored to ensure adherence, the report said.

Security is "closely aligned with system reliability and cleanliness of design. A computer system that is easy to understand and uses relatively few mechanisms to accomplish its services is one that is more likely to be secure than a highly complex one where each different service requires an additional programming package or feature," it added.

Individuals should also have a reasonable means of finding out what information is stored about him and how it is used, the report said.

In fact, the Ombudsman Committee said an organization should take the initiative to inform data subjects voluntarily that this data is being maintained about them – especially if it seems that the individual would not be made fully aware of the facts as a consequence of normal systems operation.

As an example, the committee cited an individual's becoming part of a data bank as a consequence of applying for a loan or a job. As a solution, the committee suggested a central register of all data banks of personal information. The registry could be updated annually, the committee suggested.

Data should be kept within the organization that maintains it unless the individual has given permission for specific disclosure in writing, the report said.

Such permission could be revoked by the data subject at any time. If not revoked, it should expire automatically at the end of one year, it urged.

Personally identifiable information collected for one purpose should not be used for any other purpose without the knowledge and consent of the data subject. This would minimize the risk of injury to an individual whose personal information is used for purposes that differ substantially from those uses he was led to expect, according to the report.

If personal information is demanded by a compulsory legal process, such as a subpoena, the organization maintaining the data should make every reasonable attempt to advise the data subject of that demand before handing over the requested data, the report suggested.

An individual must be reasonably able to contest the accuracy, completeness, pertinence and necessity for an organization's retaining identifiable information about himself; able to have data corrected, amended or expunged; and assured, when there is disagreement about the data, that his claim is noted and included in any subsequent dissemination of the disputed material.

Organizations that create, maintain, use and disseminate personally identifiable information must assure its reliability for the intended use and must take precautions to prevent misuse of the information.

Before creating a data bank of personal information, an information impact study should be made to demonstrate the need for the information as well as the relevance of the data.

Finally, an individual should have the right to have any personally identifiable information removed from any file if the organization maintaining the file cannot show any legal, useful, specific and productive purpose for maintaining such information, the report said.

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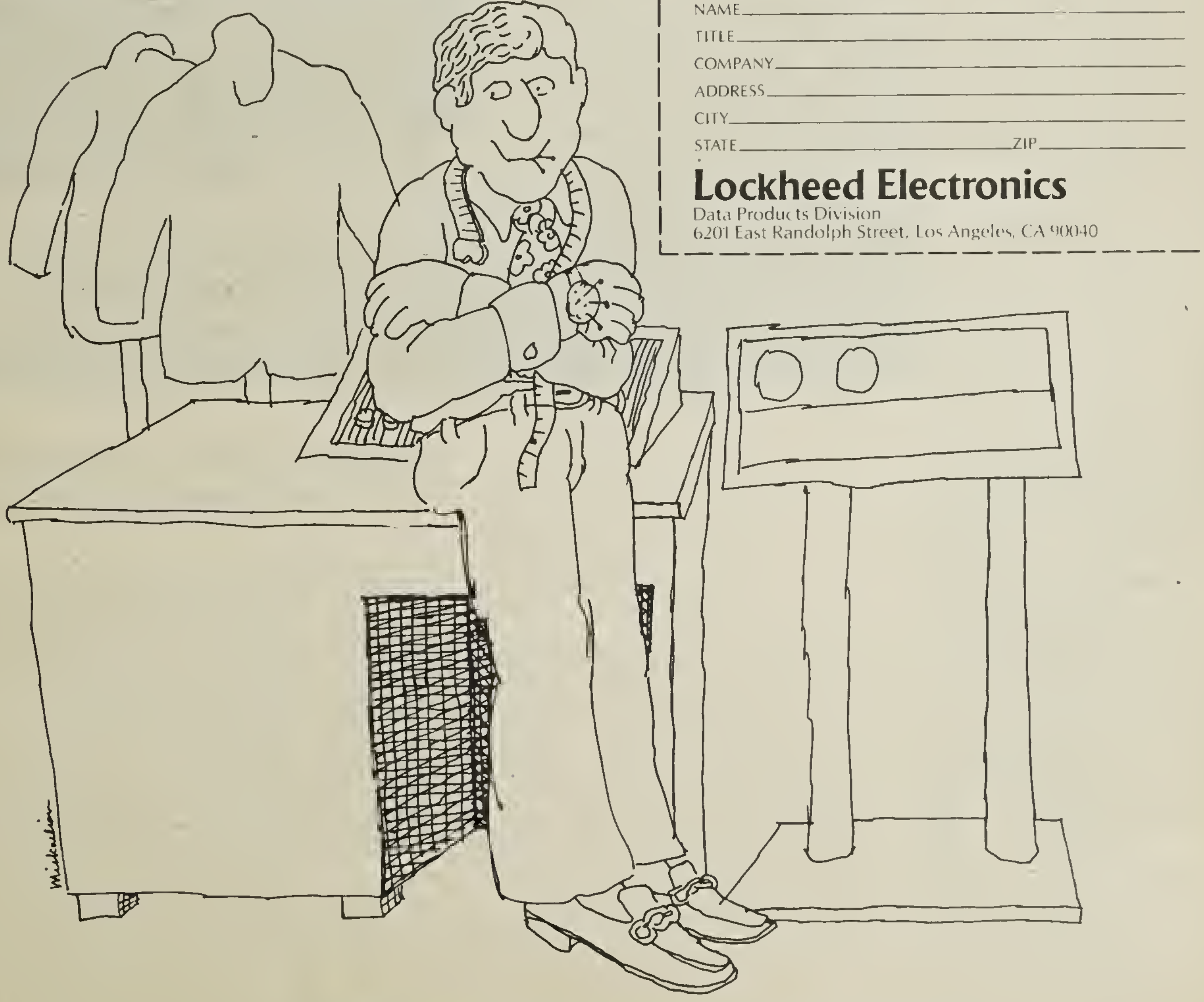

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Small Firms Moving to DP Told to Fit System to Need

By Don Leavitt

Of the CW Staff

DALLAS – The smaller the organization, the more careful it has to be moving into data processing.

The risk can be reduced, however, by "fitting a computer to a need instead of fitting a need to a computer," according to John Messenger of Lyda, Boyd Starr and Wilson, a certified public accounting firm.

Leading a workshop at the Computer Caravan here recently, the management consultant recited a list of ways in which organizations can get into data processing – through service bureaus, time-sharing or remote-computing networks or installation of equipment at the user's site.

But highlighting just how much hardware can and ultimately will be fitted to the user's needs, Messenger included microprocessors as well as minicomputers in his list of "in-house" equipment to be considered.

Micros are "just getting started, and 'you ain't seen nothing yet,' " he predicted, referring specifically to business-oriented uses of the small units. Once people understand what they really can do, they will have a number of special micros for special applications, he said.

Meanwhile, there are the more conventional options, he noted. Service bureaus, usually locally organized for "over-the-counter" batch work, come in "all sizes and shapes." These vendors can be good for high-volume jobs with heavy I/O requirements," but a user should check any of them out for stability and reputation before making a decision to go with them."

The time-sharing nets – "remote-computing really is a better term" – peg costs to usage but their biggest advantage over many local service bureaus is the bigger, faster equipment they use and the sophisticated program libraries they can provide.

Even installations with plenty of in-house equipment and staff expertise will utilize the networks for applications such as graphics and plotting, Messenger said.

Several Factors to Consider

While the means of automating applications exist in many forms, the organization trying to decide which, if any, to use must consider several factors, the consultant continued. Some might argue about the importance of some of the factors he named, he said, "but cost and management orientation have to be at the top of anyone's list."

In a small organization especially, human factors and how management is prepared to cope with them must be the primary concern. Big companies may be able to overcome human problems, but the smaller ones have to face the direct questions: Are the people who work there willing to accept change? Even if they are, what about their learning skills? Are they capable of making whatever changes are required?

Management obviously should be involved in the selection process, but not too deeply, according to Messenger.

Managers must realize that, whatever the choice, "the computer won't run the business," and the details of the selection process shouldn't tie up all a manager's time.

Costs can be both fixed and variable, he said, going on to his next major concern. With equipment and supplies "and even with people," there are costs at the front end of a project and costs that continue through the life of the system, he told the workshop. All of these must be included in any estimate made during planning, he added.

Part of the cost will go to the control function, and Messenger pointed to three levels of control that should be in a project no matter how it is implemented. In addition to accounting controls to validate the accounting information, there have to be internal controls to validate each individual transaction for coding, movement through the processing steps and final results.

But people maintain control, really, and the computer can't. That means, Messenger added, that management control supported by the computer is vital. And the only way DP can support his effort is to minimize the amount of paper coming out of the computer.

Specifically, output to the manager should be limited to exception reports for those areas for which he is responsible.

Concern for security is a new realm of concern for companies becoming involved with data processing. This includes proper care of programs and an awareness of the potential for fraud.

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Although Four Job Categories Dipped

Most Canadian DPers' Pay Envelopes Fattened in '75

By John P. Hebert
Of the CW Staff

TORONTO – The majority of employees at Canadian DP companies and sites experienced average salary increases in 1975 ranging from 2% for systems analysts to 18.6%.for junior programmers and 21% for sales representatives, a Canadian Information Processing Society (Cips) survey found.

Four of the 37 job classifications, however, showed salary decreases of 1% to 8.5% compared with 1974.

The survey generated a 38% response to 3,000 questionnaires sent to companies and institutions listed in the annual Canadian Computer Census, to a number of companies that use terminals and to software houses, Cips said.

The survey related each job classification by industry classification, then by DP rental classification, then by province, it added.

Keypunchers Numerous

The majority of personnel represented by the survey in Canadian organizations were senior keypunch operators, with 2,388 employees. The next position with the largest number of employees was junior keypunch operators, running a close second with 2,269 employees, the survey showed.

Senior keypunch operators received an average 17% salary increase from 1974 levels to $8,535; junior keypunch operators realized an 18% average increase to $7,900, according to survey results.

Top DP management had an average salary of $27,521 in 1975, or 13.4% increase over the 1974 level of $24,262.

DP managers experienced a 14% increase to an average salary of $20,406; senior systems analysts and their junior counterparts were given 14% and 16% increases respectively, bringing their average salaries to $18,619 and $15,098, the survey found.

Junior programmers experienced the second highest average percentage increase at 18.6%, bringing their average salary to $12,196 in 1975 from $10,283 in 1974. Senior programmers' average salaries increased 8% to $15,042, the results showed.

Biggest Decline

Consultants and associate consultants suffered the largest average salary decreases in 1975 with 7% and 8.5% declines from their 1974 levels of $18,770 and $15,330 respectively.

Engineering associates and senior service representatives were the other two employee catagories which experienced decreases, with salaries falling 3% and 1% respectively to $13,428 and $15,511, the survey said.

There was a larger number – from 5 in 1974 to 61 in 1975 – represented in the 1975 survey for senior service representatives, however, which may have had the effect of biasing the results, Cips noted.

Sales representatives enjoyed average increases of 21%, bringing their salaries to a $16,612 average; sales management personnel also experienced average salary increases – of 14% – bringing their average salaries to $21,704, the results showed.

The highest paid employee in the survey had a salary of $42,003 and was a manager of all DP; those receiving a minimum pay for DP employees in a Canadian organization were senior keypunch operators, with a salary of $4,640.

Junior programmers ran a close second on minimum pay at $4,800, the results showed.

State Laws Detailed

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85 Government – Federal/State/Local
90 Printing/Publishing/Other Communication Service
95 Other

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12 VP/Assistant VP
13 Treasurer/Controller/Finance Officer
21 Director/Manager of Operation/Planning/Administrative Service
22 Director/Manager/Supervisor DP
23 Systems Manager/Systems Analyst
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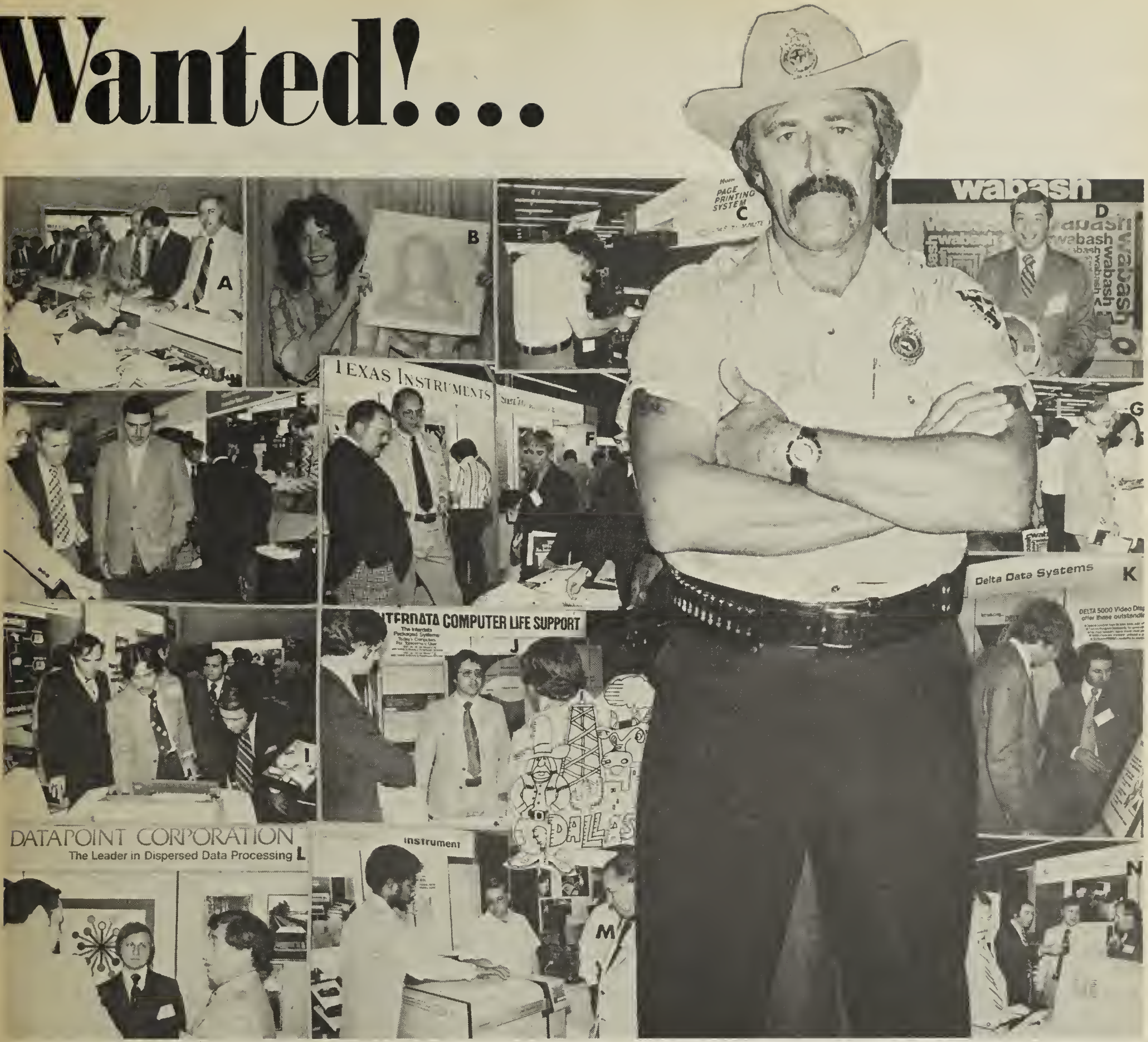

Every city on the Caravan tour has its own special flavor, but in Texas its more apparent than most, as this shot of one of our Market Hall guards shows. It was a pleasure to see this western tradition and to enjoy the relaxed hospitality that went with it. . . .In the other pictures, we tried to capture some of the things that went on in our Dallas visit, from Registration (A) to text editing (N), including: "the world's fastest printer", Honeywell's Page Printing System, being tuned up by Frank Zornes (C), and demonstrated by Marilyn Maleckas (G); magnetic media from Wabash Tape being demonstrated by Howard Beister (D); Linda Collins holding up her computer- produced portrait (B); demonstrations of a complete line of communications products and services by Don Smith of AT&T (E); "Silent 700" terminals and a new 990 family of microcomputers and minicomputers from Texas Instruments (F); Wang Laboratoies new processing applications software for its WCS small computers (I); Interdata's "Computer Life Support" systems being shown by Gerry Delaney (J); the Delta 4500 user programmable display terminal from Delta Data (K), Datapoint's complete line of processor-based terminal equipment (L); Houston Instrument's new 2400 line-per-minute, $3,000 printer (M); and text editing at Beehive, as John Cavarallo demonstrates the Edit Bee, one of several products in Beehive Terminal's Caravan booth (N). Beehive will be opening a Dallas Sales Office in June.

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Editorials

Social Security Action Needed

Congress should take immediate steps to overturn recent authorizations it has made for the Social Security Administration (SSA) because they are for apparently unneeded computer facilities.

The Congress in a fairly routine action has given the go-ahead for the SSA to build a $2.3 million temporary DP facility; a $92 million facility in Baltimore; and a $69 million facility in Woodlawn, Md. [CW, Jan. 26].

In addition, SSA has ordered -- without competitive bids – four 370/168s that are now sitting in a warehouse and promise to remain there until at least the temporary facility is completed to house them.

At the same time, a study of the computer operations of the agency conducted by the General Accounting Office – and not yet publicly released – indicated that Social Security is presently using only 40% of the capacity of the 17 large-scale computer systems it has installed [CW, April 26].

So the administration is planning new hardware even when the old is nowhere near fully utilized – a clear waste of the taxpayers' money.

Congress should immediately investigate the situation in the SSA's computer operations and halt present building plans and computer acquisitions until that investigation is completed.

FYI

First in the Minds

Twice a year, *Computerworld* conducts advertising readership studies among its subscribers. Among questions asked in the 100 personal interviews conducted each time is a "share-of-mind" question.

This is one of the oldest and simplest concepts in advertising research and involves asking a respondent which company "first comes to mind" when a particular subject is mentioned.

A company's "share of mind" is no more than the percentage of respondents who mention a company when asked to name "the company first coming to mind."

It's generally accepted in market research that the larger a company's share of mind, the larger its market share, although there is no direct correlation.

So one way to tell where a company is going in market share is to test share of mind over time. If it's going up, then theoretically the share of market should be going up and vice versa.

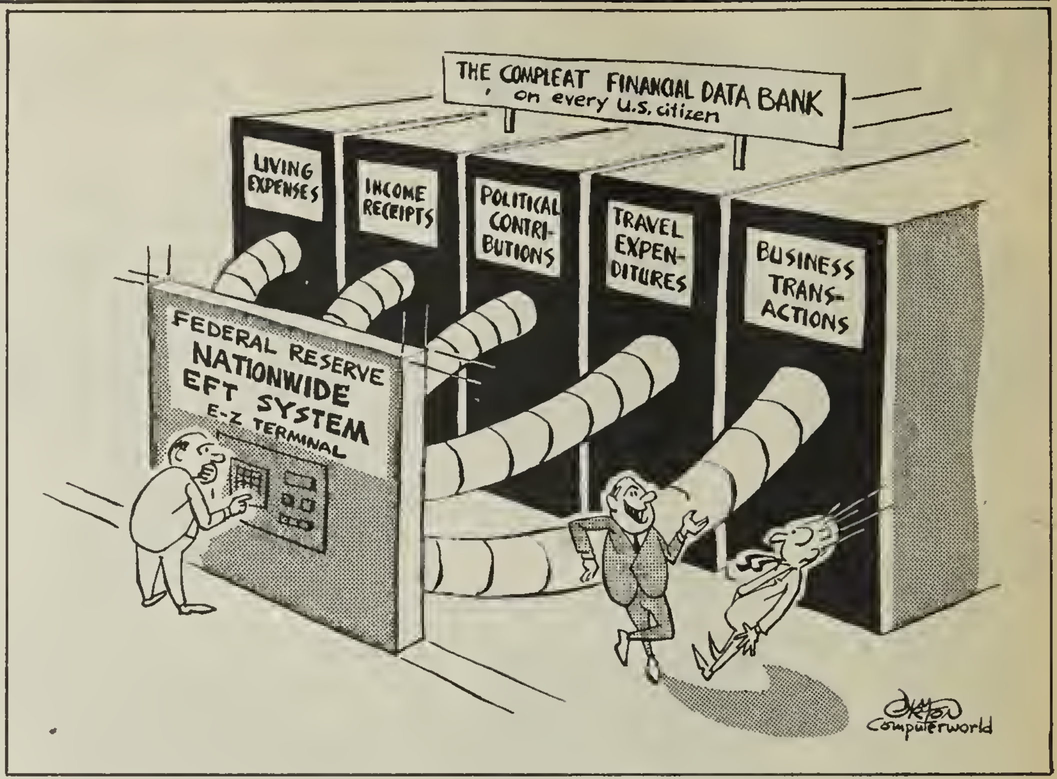
The results of our CW share-of-mind questions were an impressive show of IBM's overall dominance of at least the minds, if not the hearts, of computer users.

Share of mind was tested in 16 categories, and IBM was number one in seven of them, with a 50% or greater share of mind in four categories.

It also had three seconds, two thirds, two fourths and, in one category from which it was specifically excluded ("independent memory and processing peripherals"), it did not show.

No other company was in the same league; only two companies led in more than one category (Itel in leasing and used computers and Digital Equipment Corp. in minicomputers and miniperipherals).

No other company had a 50% share of mind in any category (DEC was closest with 45% in minicomputers), and no other company appeared in more than four categories, while IBM was mentioned in 15.



'Our First Project? Well, Up to Now, Everybody's Been Allowed to Compute His Own Income Tax . . . '

Letters to the Editor

Inflated SSA Time, Space Estimates Can Waste Millions in Tax Dollars

In supporting a wrong decision to purchase additional hardware, Social Security Administration (SSA) officials are now inflating time as well as space estimates for a system conversion [CW, Jan. 26].

As for the Model 30 programs, one approach that was not reported was that of program translation. For a changeover within the 360/370 systems, only the I/O coding would have to be changed, and I have seen translators do an effective job.

Programs could take full advantage of the larger system's capabilities, and the system overhead of emulation would be eliminated.

SSA officials must be made to understand that there are far more economical means available to increase operational capacity, other than by purchasing more machines. Their original decision must be reversed before millions of our tax dollars are wasted.

Mark Seigel

Brooklyn, N.Y.

Dissatisfaction a Surprise

It was with a great deal of surprise that I read in the April 12 issue of *Computerworld* the article entitled "School Buys Unit From Independent." Yvonne Dettloff, vice-president of Sawyer Business College, said she had purchased a printer from an independent supplier because she "was dissatisfied" with service on a Basic/Four Corp. system.

Upon checking our records I found some problems had indeed developed with the original printer after three years of trouble-free operations. After several attempts by our sister subsidiary, Sorbus, Inc., to repair the printer, it was determined that the printer had worn itself out. As most manufacturers know, it is not unusual for a printer to show wear and tear after such a period.

In 1975 Sawyer purchased a printer from an independent company and in the first part of 1976 it bought an add-on printer. Difficulties did develop with the system again and, upon discovering that Sawyer had violated its agreement with Basic/Four and Sorbus by adding equipment that was designated incompatible to the system, Sorbus did not want to accept the responsibility for repairing the system.

There are two sides to every issue, and the Sawyer story is nowhere near as unfavorable to Basic/Four and Sorbus as the article implied.

Donald Schnitter
Director of Marketing Services
Basic/Four Corp.
Santa Ana, Calif.

What Is a Systems Girl?

Herb Grosch's column, "Author, Author!" [CW, April 19] mentioned a "systems girl." This was in context with an IBM engineer and technical salesman.

What is a systems girl? Very few *girls* read his column, Many *women* do. Many of those are systems analysts.

Danielle R. Bernstein

Metuchen, N.J.

(Other letters on Pages 19 and 20.)

Data Past

Five Years Ago
May 5, 1971

PALO ALTO, Calif. – Salaries of programmers and other DP personnel rose in the last year, according to the most recent survey performed by Source EDP, a national placement firm. The survey results showed a 1% to 2% rise, differing from a survey conducted by Robert Half agencies which saw a 2% to 10% drop in DP starting salaries.

– – –

SANTA MONICA, Calif. – The Association for Computing Machinery (ACM) witnessed the birth of the ACM Special Interest Committee on Compumetrics to measure computer hardware efficiency, software efficiency and results.

Eight Years Ago
May 1, 1968

WASHINGTON, D.C. – The first nationwide telephone strike in more than 21 years threatened to but did not immediately affect data communications in the form of time-sharing services or other remote computer operations. The striking Communications Workers of America included 200,000 Bell Telephone System and Western Electric Co. workers.

– – –

WASHINGTON, D.C. – Votes by some 2 million students on presidental candidates and national issues were processed, totaled and analyzed for the first time by a computer in Choice 68, the national collegiate presidential primary. A Univac 1108 computer system handled seven types of data from each punched-card ballot, comparing and analyzing the voting.

Nine? No! Ten? Oh!!

I went to a most curious but well-attended meeting in Anaheim recently. Sponsored by the Los Angeles Section of the AIAA, American Institute of Aeronautics and Astronautics, in cooperation with the IEEE Computer Society software engineering committee and the ACM, it was called, "Software Management (Defense Systems and Other Federal Programs) – A Major Conference on New Government Initiatives." Billed as the most significant computer/software conference of the decade, which it surely was not, it had been given two weeks earlier across the street from the Pentagon. The whole cast then migrated to Disney Country and did it for us West Coasters: presumably it was cheaper to bring the mountain to six hundred Mahomets, almost all of whom were Pentagon pensioners!

Great dollops of *deja vu* were doled out. The theme was efficient software, and where possible less expensive hardware, in tactical and strategic applications. Not data processing, you understand – my old nemesis the Brooks Bill was supposed to have straightened that out some years back. In the role of Jack Brooks, singing the siren song of better procurement, better acceptance testing, better utilization, shared efforts and (you guessed it!) software standards, was Jacques Gansler, Deputy Assistant Secretary of Defense (Materiel Acquisition), Office of the Assistant Secretary of Defense (Installations and Logistics), Department of Defense. Jacques was sound – but so was Jack, in 1965. The song was sweet, the audience attentive; to somewhat paraphrase the old saw, contracts maketh a ready man. And the rustle of study money was audible on the dais several times.

But I wax unfairly critical. The DOD people, their henchmen from the Applied Physics Lab and Mitre (early, ah, rustlers?), a knowledgeable victim from TRW, and the audience itself were quite genuinely worried. They will fly *six hundred thousand* lines of specialized weapons and operations software in the B-1 bomber, and as large or larger a package in AWACS. The horrid Wimmix boondoggle (Worldwide Military Command and Control System) was presumably far vaster. And each line costs the earth to write and debug and activate and maintain.

Gansler and his associate Barry De Roze gave rough but terrifying estimates of $4 *billion* a year, Allah preserve us! That didn't count the hardware, you understand, the costs of which are likewise subsumed in aircraft and missile and nuclear submarine and army tactical system budgets.

They want to do all the Right Things: analyze and validate requirements, plan and review acquisitions, improve estimation methods both for size and for cost, measure software performance more precisely, manage personnel – and standardize, of course.

Right here my *deja vu* (that's fancy for "Let me show you my bruises!") made me quiver like a giant gong. Shades of Dickens! I was Scrooge again, calling for Floor Equals Ceiling COBOL, and the ghost of Marley was rattling his chains. An apprehensive voice further back in the auditorium seat: No, no old ghost! Avaunt thee! Vamoose!!

"Nine." Nine! NINE? "Well, that's tentative," said De Roze, and listed three or four JOVIALs, a FORTRAN, a COBOL, and a bunch of mystery names that sounded like politicians' license plates. Of course the rationale was obvious: if you have an operational weapon, a "battlefield" artifact, with hundreds of thousands of lines of integral software, being upgraded and simplified and expanded and validated in some obscure Munchkin dialect, that language must survive. And there are dozens of such artifacts, from SAGE to the Airborne Pentagon, from Rickover to Startrek. So, nine!

But further horror was yet to come. Surely some consolidation, some translation, some reprogramming lay ahead? And of course, new systems are being proposed. What language will revisions and new stuff use? Well, there are things to consider like interservice rivalries, and supplier competition, and professional egos. So pull back the curtain: a tenth entrant; here she comes, Miss America – DOD/1!!

We saw it years ago in data processing, of course. FORTRAN had caught on; IBM and its late-Fifties competitors had candidate commercial languages; experts like Bob Bemer were writing feverishly. Zong! COBOL! Out of the blue – or out of the Pentagon, by Charlie Phillips, to be more precise. And twenty years later, we may have a replay: a brand new military software language.

There is a directive, DOD5000.XX (sic!) being issued. It will, along with the other Good Things, refer to this concept. Already an eager clan of contractors can be heard clamoring at the gates: "Let *me* write it! No, me!" The man to see is a light colonel named Bill Whitaker, in ARPA. He *likes* Higher Order Languages. Lots of 'em! Make him an offer.

But don't let me know. I can't bear it!

Herb Grosch

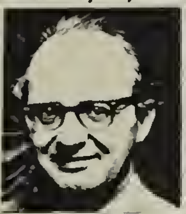
Readers Invited to Submit Results

Experiment Could Prove Error in Technical Formula

Robert Zenhausern of St. John's University in Jamaica, N.Y., has a problem. Some of his students have been getting wrong results – and not for any of the standard reasons.

They have been using perfectly good operational techniques and then analyzing their results mathematically on the computer, using standard software.

The Taylor Report
By
Alan Taylor, CDP



Unfortunately, it turns out the standard software is wrong. Not just one particular routine is wrong, but also the manual. Some textbooks also have taken a wrong approach to the question of split-plot variance.

Zenhausern knows the correct approach and realizes the errors must already have resulted in many, many studies being incorrectly analyzed. He wants this error to be recognized so that future studies will be performed correctly, so he has written a nine-page paper explaining the problem.

Now he has asked me where and how it should be published in order to gain the widest publicity. And the answer is that I know of no place where adequate publicity can be obtained. Computer papers, such as this one, are read by people who are computer people in the main. Mathematical journals, for it is a math problem, are read by math specialists. But books and routines, once published, distributed and copied, have an independent life of their own. I can't think of any single source which has the ability to handle this type of issue. So let us look at Zenhausern's problem.

Split-Plot Variance

When a study is performed – say of the reading, writing, arithmetic and singing scores of three students in each of three different classes – the results of the study are first noted. Zenhausern used the following illustration:

A	S1	10, 16, 9, 15
	S2	15, 13, 8, 19
	S3	14, 18, 6, 20
A	S1	9, 7, 17, 10
	S2	12, 7, 15, 13
	S3	11, 5, 14, 11
A	S1	8, 9, 10, 4
	S2	7, 5, 16, 3
	S3	4, 8, 14, 6

The four numbers after each S1, S2 or S3 represent the B1, B2, B3 and B4 values for the specific A/Sn combination.

Now that is something with which you can work. Here is where publication can help. The problem, according to Zenhausern, is that these will be incorrectly partitioned if you follow some split-plot routines and texts.

There is the data he is using, so feed it into your computer or pull out your texts and see what results you get.

This way we will find either that no one else gets wrong results or that only the cases Zenhausern has discovered already are wrong or that more errors are floating around than anyone realizes.

Send the results – good as well as bad – to me, or to Zenhausern, together with details on how they were obtained, and we will be able to measure the scope of the problem.

As for the math problem, this is related to the error calculations that are performed during such an analysis. These are the calculations which determine whether the results of the experiment are worth using or whether they are inconclusive.

The test of the error is based upon the average sum of the squares between the observed and calculated results. This in turn is based upon summing the squares and dividing by the number of subjects.

Math people use two groupings to break up this type of question – "between" factors and "within" factors. A between factor is one in which a subject appears on only one level of an independent variable, while a within factor appears on all levels of the variable.

Zenhausern gives as an example that, when males and females are tested at several time periods after some treatment, time is a within factor. This is because all subjects are tested in each of the time periods – nine tests each if the tests last nine weeks and are performed weekly, for instance. Sex, however, is a between factor because any one subject can have only one sex.

The error is occurring right here, with the software and the texts apparently forgetting this and treating each subject as being able to have both sexes! This occurs because the error terms based upon the interaction (or product) of subjects and sex.

Following this rule results in wrong error terms, although just how wrong will depend upon how the number of "subjects" is chosen.

Are there, for instance, nine subjects when three students in three classes are examined in four areas? This would apparently mean there would be nine subjects multiplied by four scores multiplied by three classes, or 108 scores. In fact, there are only 36 scores.

Alternatively, are there only three subjects? This means that the system is treating three different students as a single individual and Zenhausern finds this untenable and able to destroy the validity of the calculated errors.

That then is the problem. The question is where is the solution? Zenhausern's answer is to publish, which is perhaps the best that can be done in this instance.

We in the computer field must wake up to the fact that, as computer routines become more and more embedded in texts and systems, we are vulnerable to such buried errors.

And then we must take appropriate precautions because we know of the potential hidden dangers. That is going to be expensive and will be fought.

But unless there is some way in which the faults currently embedded can, once located, be extirpated by publication or some other means, I see no way of avoiding this expense and keeping within our professional responsibility not to overstate our accuracy. Risking the use of routines with known but ignored hidden defects is certainly unprofessional.

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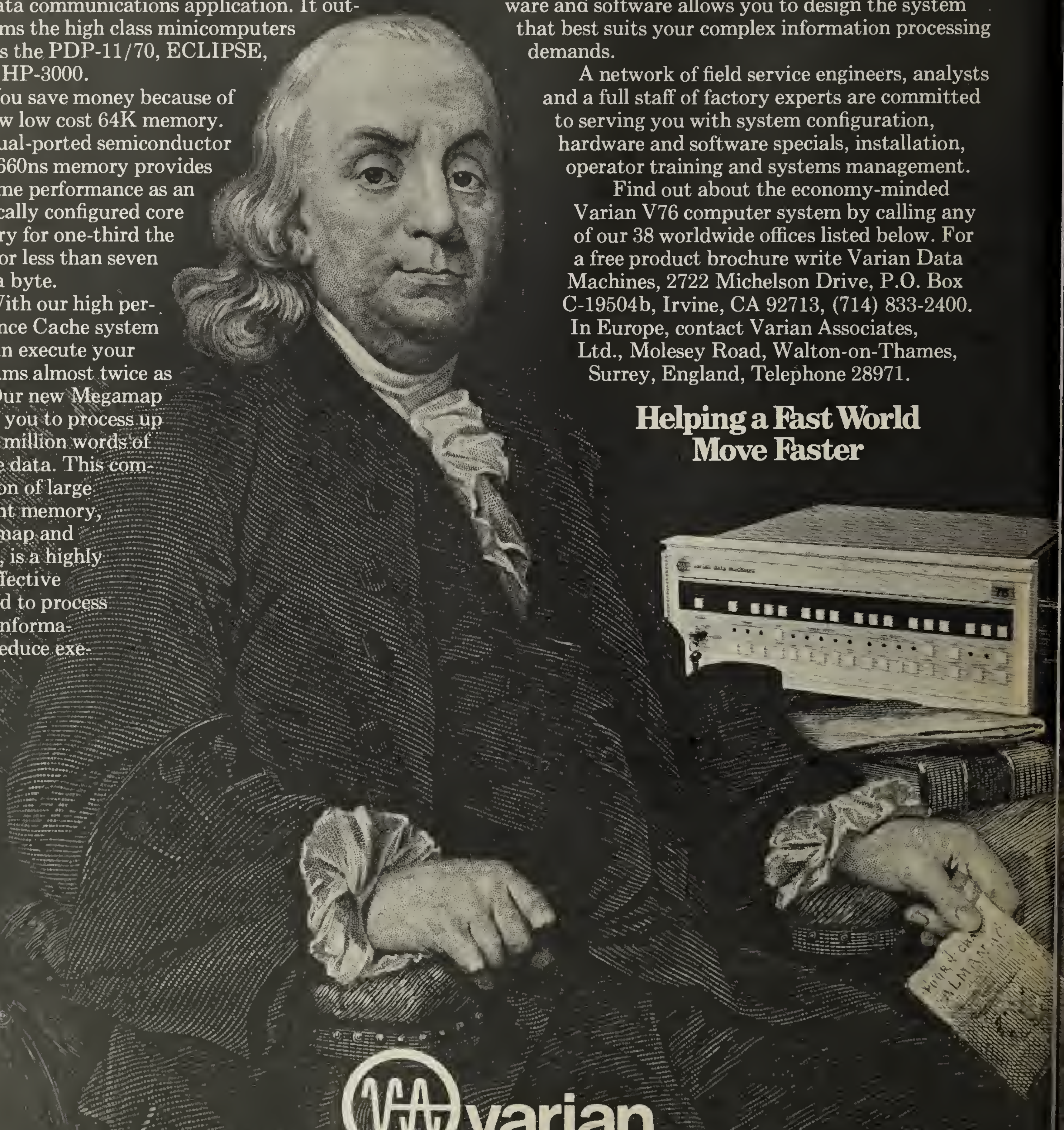

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Letters to the Editor

Validity of Survey By SCDP Questionable

It was with some amusement that I read Kenniston W. Lord Jr.'s most recent attempt to convince the DP professionals of this country Certification Data Processing (CDP) is a good basis for licensing ["Holders Say CDP A Reliable Basis for Licensing," [CW, April 12].

If his belief in the statistical validity of his survey is any evidence of the knowledge required of CDP holders, the value of that certificate drops still further in my eyes.

The even dozen percent statistics cited in the article refer to percentages of 100 respondents (only 12-1/2% of those surveyed) who represent a mere two-thirds of 1% of the CDP holders, who themselves are a small percentage of the DP professionals in this country.

By surveying only Society of Certified Data Processors (SCDP) members, the results are already skewed in favor of the licensing proposal, in light of the fact that it is SCDP which is most vocal in this area – or is it simply Lord who is most vocal?

The low response rate among even SCDP members should say something about the true interest in this question. I wonder what percent of the total number of CDP holders might be in agreement with this silliness?

And what percent of all those of us in DP have not even bothered to pursue certification/licensing that far? Somehow the daily pursuit of knowledge and the ongoing work experience seem far more meaningful and useful than Lord's current mania for requiring every DP professional to get the same ego-inflating frameable certificate he has learned to love so well.

Somehow it is less than surprising that those people who hold the CDP and belong to SCDP would be most interested in licensing and in proposing the CDP as its certification medium. When only 9% of those people are sufficiently interested to respond affirmatively to this questionnaire, maybe it is time to consider whether we and *Computerworld* may not be giving this whole question far more attention than it is due.

David Martin
Wallingford, Conn.

Inviolable Property?

As chairman and toastmaster of the Homebrew Computer Club, it was my privilege to read Herb Grosch's column, "The Worm In The Apple," [CW, April 5], to the multitudes assembled.

The body was left in a stunned silence, however, at the suggestion that we little fish should set an example for Big Business and Big Government. Really, this is 1976.

The amateur computer folk are the first group of users (with the possible exception of educational users) who do not regard computer hardware and software as capital goods, intended for the purpose of making money. How many people have to pay a royalty to borrow a book from a library?

Grosch's implied characterization of the Homebrew people as thieves and/or shady operators has not been borne out by investigation, according to a report given at the same meeting.

That "counter-culture attitude" which Herb denounced is a little more complex than his characterization that "private property is obsolete." The uses to which a segment of the state of the art is applied seem to have some bearing on their status as inviolable property.

Lee Felsenstein
Berkeley, Calif.

Don't Blame DPers

It would be well for Alan Taylor to apply to his writings the same sort of principles he espouses in writing for good systems design: knowledge of the subject, objectivity, accuracy and sufficient in-depth consideration of the subject.

Regarding the column, "'Second-Collision' Errors Can Cause Problems for DP" [CW, April 5]:

- A check is not "paid into" an account other than that on which it is drawn. It is, rather, deposited into another account and ultimately paid from the account on which it is drawn.
- A check being posted against the account it is drawn on for $7 rather than $700 will result in an excess in the account of $693, surely not causing any checks to "bounce." Virginia's rejected checks were no doubt due to the deposit into her account being encoded as $7, as well as the check against Norman's account.
- The entire situation in this example of a "computer systems failure" has nothing whatsoever to do with the bank's automated posting sytems. It appears to be a proof error, plain and simple.

The only point in the entire article that makes any sense at all is the obvious fact that the bank was seriously remiss in its follow-up to rectify the error, regardless of how it occurred. This, however, is a customer-relations type of problem and a staff training problem, not one dealing in any way with the design, installation or operation of computer systems.

H.J. Eaton
Reno, Nev.

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Letters to the Editor

Date Checks in Year 2000 To Cause Many Disasters

I have to wonder how many thousands of programs living off date checks and/or date relationships will either come to a screeching halt or produce garbage results as the year changes from 1999 to 2000.

I have already experienced the beginning symptoms of this disaster.

A bond maturity projections program in a system that my company maintains for a client recently went berserk producing negative projection figures. Examination of the program quickly revealed that 25-year projections based on a file date with the year recorded as 75 produced the erroneous results when the calculated maturity year became 00.

Also, I'm sure many have read about the 105-year-old woman born in 1870 who received notice to start kindergarten because the birth year in her school file record was maintained as 70. Subtraction of her birth year from the processing date year (75) determined her to be 5 years old.

I strongly advise that the program designers of today stop worrying about the few bytes being saved by specifying years as YY and start worrying about their good name being maligned when we turn the century. I know I won't be around by then, but will they?

Marvin Goldstein
Garden City, N.Y.

IBM Could Crack AT&T Nut

The purpose of *Computerworld* seems to be to promote equipment and services by any non-IBM vendor for the betterment of the users' and manufacturers' pocketbooks. The March 22 issue took two giant steps backward from the above goal.

The front-page story highlighted a proposed six-point consent decree between the government and IBM. Point No. 6 was "Bar IBM . . . from the communications business . . . permanently."

The first editorial in this issue asked "the very real question of who will provide the communications services that users need to run their businesses."

I think CW is becoming antiuser. IBM has the resources, talent and determination to crack the communications services nut wide open so that other manufacturers can expand their services and provide competition/competitive pricing.

Just as Xerox had to lower prices when IBM and others cracked the dry copier market wide open, AT&T would undoubtedly have to lower prices should IBM and others get into the communications market.

Richard R. King
Elmhurst, Ill.

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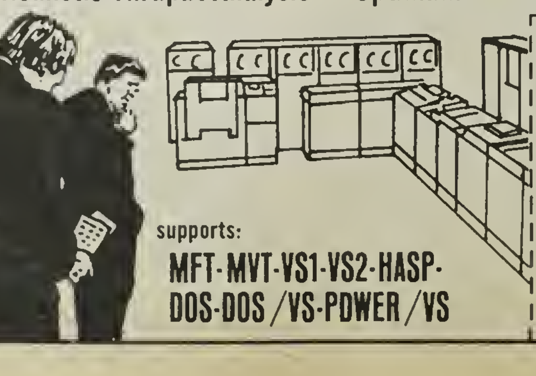

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Sort Package Delays Blue Cross Shop's Disk Upgrade

By Don Leavitt
Of the CW Staff

SEATTLE – How much good can a software package do?

The answer obviously varies with the package and the installation, but Jim Stoneman, a systems planner at Blue Cross of Washington and Alaska (BCWA), has a clear picture of what an independent sort package meant to his shop.

As a result of benchmarks and estimates of workload growth made during evaluation of two different non-IBM sorts, Stoneman found that, with one in particular, "we could put off purchasing new disks for some time.

"The original projections showed that delay could be almost a year and a half before we'd definitely have to upgrade," he added.

The disk upgrade, however, is coming sooner than the original projections indicated, but that's primarily because BCWA has changed its basic mode of operation by moving toward a data base management system and teleprocessing, both of which use disk heavily, he said.

Stoneman is satisfied with his choice, the Syncsort package from Whitlow Computer Systems. "In the seven months it's been here, it's performed better than we had anticipated.

"Except for our change in operation, we could have streteched the disk acquisition out to just about three years," he said.

BCWA isn't always pleased with packages, he noted, and the situation it faced before acquiring Syncsort did not, at first, even seem susceptible to a software solution. The company has an IBM 360/65 with 3330-type disks from Memorex, IBM 3420 tape drives and various other peripherals.

"We were using every byte" of the 1M memory on the system, but that didn't seem to be a problem. As the workload increased, the multiprogramming factor also rose until it was up to "around 5."

But operations was running into hang-ups as it went through the production cycle and the problem seemed to have a definite pattern. Sort steps were waiting for disk allocation – "essentially for disk space that just wasn't there."

Squelched First Impulse

Under those circumstances, Stoneman's first impulse was to add more disk, but he then thought out the problem further. "Seeing the sort/merge utility represented about 40% of the job steps through a production cycle," he decided to look for a software solution.

There was enough disk space to do the sorting, he reasoned, but it had been fragmented as the data base and on-line files grew. IBM's SM1 sort package, then in use at BCWA, could not work with the fragments, requiring instead contiguous space allocation.

Production's problems with job steps waiting for space were almost all with sorts and occurred often enough – "at least once a day" – so Stoneman evaluated both Pansort from Pansophic Systems and Syncsort. The study period covered a good bit of last summer, he said.

"Since the day we installed Syncsort, we have not had a single hang-up waiting for disk allocation on a sort in a production run," he continued.

"That is because [Syncsort] can use fragmented memory and include automatic use of secondary allocations when that is necessary," he explained.

'Turnaround Sorting'

Syncsort is very fast "partly because it will run a sort completely in memory if the file is small enough," Stoneman said, adding that Syncsort "will do this 'turnaround sorting' whenever it can, even if we didn't realize the input file was that small."

The Whitlow package uses balancing and switching techniques that "get the most out of the disk work areas" and it "comes up with much more efficient throughput, better data transfer and less CPU time [than SM1]," he said.

Currently BCWA's 360/65 is running "at about 42% of capacity" as measured in machine cycles by IBM's OS/PT1 monitor. IMS uses almost half the system's core, and the center is operational 24 hours a day, five days a week, under OS/MVT Release 21.8, with multiple console support and Hasp.

User-Built Utility Eases Upgrades From B300/B500s

BAKERSFIELD, Calif. – Installations moving from Burroughs B300/B500 systems to the B1700 and larger models of the B700 series can convert Assembler source programs to Cobol for the bigger machines with a translator package now available from Hopper, Inc.

Originally developed by Hopper, a steel products distributor, for its own conversion effort, Translator runs on the B300/B500 or, under emulation, on a B1726 or B1728.

Users can therefore start the conversion while their old equipment is in place and complete it after the new CPU has been installed, a Hopper spokesman said.

Working from either basic or advanced Assembler source programs, the package is said. to be capable of generating "95% perfect" Cobol source code.

Translator itself is supplemented by pretranslation diagnostics and post-translation aids to minimize the user's own efforts, Hopper added.

The user has the option of providing substitutes for the Assembler names of constants, paragraphs and files so the Cobol output is as meaningful as possible. In addition, Translator permits the user to replace tape-oriented I/O files with disk-based data sets.

The Hopper Translator can convert Basic Assembler zone commands, address-modification operations, "address of" literals, test sense switch commands and mask operations, converting each into an equivalent Cobol construction, Hopper said.

Although intended as a Burroughs-to-Burroughs transition support, Translator may be useful also to installations moving from B300/B500 gear to other CPUs supporting Cobol. Used in this manner, however, the generated Cobol might need more user "tuning" before compilation on the new host.

The package is available under license for $7,000 from Hopper at 301 Espee St., Bakersfield, Calif. 93303.

File Access/Retrieval Options For RSTS/E Extended by 'Misam'

MONTREAL – The Multiple Index Sequential Access Method (Misam) allows users running under Digital Equipment Corp.'s RSTS/E environment to access records within files for retrieval, creation or alteration by one or a number of key fields, according to the package's vendor, MBI Data Processing.

Misam can be considered an intermediate step for users who expect eventually to move to a data base environment, MBI said.

Alternately, it can be a vehicle for users who do not wish to understand the complexities of a data base management system, but who find the limitations of DEC's IAM and Isam unacceptable, a spokesman added.

In addition to supporting multiple key searches, Misam includes various utility routines which allow a printout of accounting information about Misam usage. File reorganization is also provided by another Misam utility, the vendor said.

Misam logic was described as more efficient than IAM, operating in less than 8K words of memory regardless of how many programs are using it. On most commercial systems, it can be "locked" in memory to give fast response time, MBI added.

There are several limitations to the power of Misam, the vendor noted. These range from the requirement that all indexes must fit in 33M bytes to the fact that there is no management of the data file provided by Misam; it must be done entirely by the programmer.

Although Misam maintains a file of indexes, it is "totally divorced" from the user's data. Misam simply tells the user where the desired record is, based on previously stated keys; the programmer is responsible for actual data manipulation, if any is required.

Although the Misam package can be leased, MBI would rather trade its software to another installation "for something equally interesting," the spokesman said from MBI at Suite 1104, 1500 Ave. Atwater, Montreal, Quebec H3Z 1X5, Canada.

Package Generates IBM 3 OCL

HOUSTON – Operational Control Language (OCL) statements for an IBM 3 program can be coded in 30% of the time required for manual coding by using the Control Language Generation System (CLGS) from Diversified Services, Co., a spokesman said.

The system makes use of two RPG-like coded sheets on which the programmer enters file names and other functional parameters. From these, CLGS generates appropriate OCL procedures which are stored automatically in a disk-based library, the spokesman said.

The user may also pass into the library specifications for such things as sorts to be included in the operational OCL, he added.

CLGS includes its own error-checking routine, which eliminates many of the usual OCL coding problems, according to the vendor. Because the system generates the actual OCL, many spelling errors and other formatting flaws are avoided completely, the spokesman claimed.

CLGS runs on IBM 3 models 8, 10, 12 or 15. The minimum acceptable configuration is 12K memory, but the system runs more efficiently when at least 16K is available, according to the vendor.

The software is shipped on fewer than 2,000 96-column cards or on diskette.

CLGS is available now for a one-time cost of $300; the firm can be reached through P.O. Box 861, Houston, Texas 77001.

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Training Small Part of Personnel Development Plan

By Jack L. Stone
And Alexander P. Grant
Special to Computerworld

A typical computer center is conceived in crisis and developed in chaos. Those who survive generally reach some plateau of usefulness and productivity at least minimally acceptable to top management.

During this time of travail and developments, computer center management lavishes great attention on both the technological and the personnel needs of the center.

In many established computer centers, however, managers continue to concentrate on technological improvements to sustain and increase productivity; they generally avoid serious consideration of personnel development.

In such installations, the general level of personnel performance tends to deteriorate until the productivity of the center's work force is below that required to apply current computer technology in an effective and economic manner.

Faced with such a condition, a surprisingly large number of DP center managers scem to believe the only tool for improving personnel productivity is technical training.

Results Sometimes Negative

As vendors of DP training and personnel development services, we have a vested interest in fostering and encouraging such attitudes; however, simple honesty compels us to observe that an unfortunately large percentage of training activities do not result in better performance on the job.

This is one of a series of articles by these authors. In this article, Stone and Grant highlight some of the ways in which motivation affects the effectiveness of people in a DP center. In the next, they will focus on the role of the operators and how management can support and encourage them.

Unsatisfactory training outcomes may, in part, flow from poorly designed or poorly executed training programs, but are more frequently chargeable to other factors.

One of these factors is that managers and supervisors often do not fully recognize it takes more than training to move people to produce. The employee must want to produce; he must be motivated to produce.

It is important to recognize here that motivation for productivity is not necessarily the same thing as high employee morale. An employee who is diligently extending his own knowledge and skills may have excellent morale, but he is not necessarily the most productive worker in the center.

The worker who accepts training reluctantly and always has a gripe may, on the other hand, produce at a high level.

Management Responsible

Motivation for productivity does not arise in the work force simply because the managers and supervisors are "good guys," nor does it stand alone as the only requirement for achieving improved computer center production.

Simply stated, development and utilization of human resources in the DP center is a management responsibility that can be dealt with in the same planned, orderly and reasonable way in which other management responsibilities are approached.

Peopleware

The resources and tools available to the manager for improving the productivity of his people fall into three categories:

- Standards, policies and procedures that facilitate the evaluation of organizational and individual capabilities and productivity.
- Organizational, job and career structures that promote both organizational effectiveness and individual growth in productivity.
- Personnel development programs that take into account both the needs and goals of the individual and the operational needs and objectives of the computer center.

Important Questions

Attainment of the objectives of improved employee productivity requires the computer center management team to recognize and deal with all aspects of human resource management. Too often, however, the immediate crisis prevents meaningful consideration of such management responsibilities.

For example, when was the last time

(Continued on Page 23)

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DEC Users Gain Fortran CSP

MANLIUS, N.Y. – Introduced by Manlius Valley Enterprises, Inc. (MVE), a Commercial Subroutines Package (CSP) for Fortran IV users working on Digital Equipment Corp. PDP-11 equipment is code-compatible at the source level with IBM's 1130 CSP and Ideal packages, according to the vendor.

In those cases when routines in the earlier IBM packages are redundant in purpose, the better of the two was selected for inclusion in the MVE package, an MVE spokesman claimed.

Any routine that is unnecessary – because of the increased power of the PDP-11 instruction set or the "unlikely inclusion of a particular device" in a PDP-11 configuration – was not included in the MVE packaging, he added.

The MVE package will function on any PDP-11 capable of supporting Fortran IV. A perpetual license costs $1,000.

The object code is distributed on paper tape, DEC RK cartridge disk or RX01 diskette, the vendor said.

MVE can be reached through P.O. Box 232, Manlius, N.Y. 13104.

'Alert' Split Gives User Choice

ROCKVILLE, Md. – The capabilities of the Alert performance analysis package have been split by Comten's Software Products Division so that users may acquire only the particular tool they feel will help them most.

Alert works with IBM's SMF data, but differs from most other data reduction packages by presenting both tabular and graphic data and a narrative description of the situation they illustrate. The situations on which reports are generated are user-selectable from a "menu" of some 40 possibilities.

Now the package has been split into the Performance Analyzer, which pinpoints specific inefficiencies at the system, program, job and data set level, and the DASD Management System which provides both space and usage measurement of direct access volumes and data sets.

As in the past, the Performance Analyzer is an exception reporting system which includes narrative explanations and recommended corrective actions as part of its reports. Some applications are in centralized performance audits, performance evaluations and in operations quality control, Comten suggested.

Under the DASD Management System, users are provided data for determining off-line vs. on-line status of files, for identifying inactive data sets and for planning and controlling DASD capacity. Customers have recaptured as much as 20% of their DASD space using this software, the vendor claimed.

Alert runs on IBM 360/370 systems with OS/MT or MVT, OS/VS1 or VS2.

Basic license fees for each of the two Alert pieces is $8,900, but options may increase those fees substantially. Basic fee for both halves or what is in effect the full basic Alert system is $14,000, Comten noted from 2 Research Court, Rockville, Md. 20850.

Motivation Key to Development

(Continued from Page 22)

your computer center management team convened as a group to ask and find answers to such questions as:

How much of our daily quota of problems comes from shortfalls in the job performance of our people?

Do our people really understand their jobs and their roles on the DP team?

Do they have the knowledge and skills required by their jobs?

Do they have the attitudes and motivation to work to support the objectives of the organization?

Do our people have the understanding and communications skills to interface effectively with the outside work, i.e., users, top management and others in the organization?

Do our supervisors and employees have mutual respect for each other?

Exercise of Functions

Adequate supervisory attitudes and skills are necessary but not sufficient support for an effective human resource management program. Another important ingredient is a personnel development program that serves both the individual and the organization.

Development and execution of such a program calls for exercise of a number of management/supervisory functions. First, management must objectively evaluate each individual employee in terms of his skills and knowledge in relation to his job.

In addition, the individual must be assessed in regard to his attitude toward his job and the organization; his future job goals; and his contribution to supporting the organization's productivity objectives.

Second, management has a responsibility for participating with each individual in the generation of a realistic personal development plan that is consistent with both the individual's and the organization's needs and objectives.

The plan should include all activities that are factors in the individual's career progress, including current and future work assignments, formal training, on-the-job training and participation in management/employee committees, workshops or other participatory management programs.

Further, as the plan unfolds and the individual progresses through the plan, periodic checks must be made to evaluate progress toward the plan's goals and to revise the plan in the light of changes in either the organization's or the individual's situation or objectives.

Third, job-oriented effective training programs must be developed and implemented. Such training should be available as needed for all employees in the computer center. Each course developed must be clearly and proximately related to the operational needs of the organization.

Finally, policies and procedures that assure good internal communications are needed to prevent misunderstanding and lack of information from negating improvements in productivity that have been achieved by other facets of the human resource management program.

Stone is the managing director and Grant a senior associate of Computer Education International, Inc. in Washington, D.C.

Just completed...a definitive study

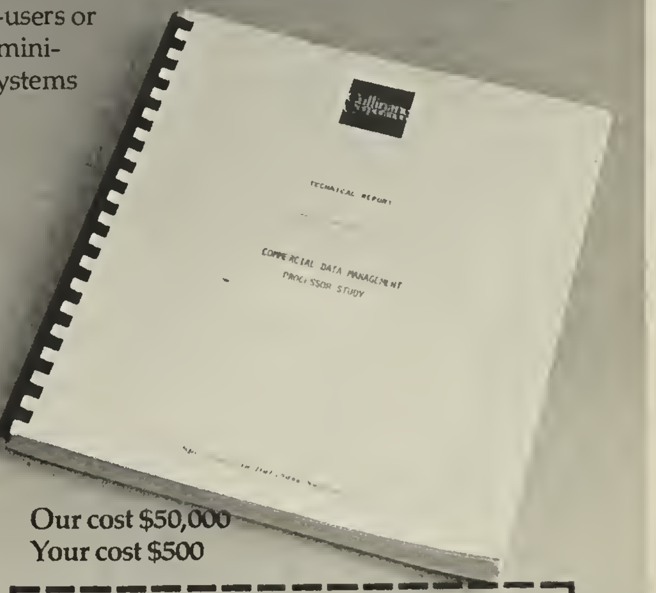
Back-end Database Management Systems

Developed by Cullinane Corporation with supporting research from a major university, this $50,000 study (jointly funded by Cullinane Corporation and several key potential end users) is a definitive state-of-the-art treatment. Purpose? To lead to a commercially viable back-end DBM system.

The study will be of real value to end-users or computer manufacturers interested in using minicomputers interfaced to IBM 370's or other systems in back-end or distributed data processing.

Not a theoretical treatment, these are the major subject headings which make the study practical and valuable:

- ☐ Back-end DBMS concept. Advantages, disadvantages, conclusions.
- ☐ Host/back-end configurations. Five possible arrangements.
- ☐ Database technology. CODASYL specs and IDMS implementation.
- ☐ Distribution of software in a host/back-end configuration.
- ☐ The inter-computer communications system. (ICCS)
- ☐ Mini-computer architecture.
- ☐ Back-end hardware requirements for a DBMS.
- ☐ An evaluation of 33 mini-computers for back-end use.
- ☐ DBMS performance in mini-computers.



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Net Developed In-House Keeps Bank's Costs In-Line

By John P. Hebert
Of the CW Staff

BUFFALO, N.Y. – After embarking on a fruitless search for an automated loan authorization system, a large bank here decided to develop its own.

The system was made necessary because of a financial squeeze two years ago when the prime lending rate shot upward, according to Alan Wiles, vice-president of computer operations at Liberty National Bank and Trust Co. (LNB).

A Teleprocessing Loan and Authorization System (Atlas) is completely automated from the initiation of the credit application through the printing of a magnetic ink character recognition (Micr) book.

The Personal Loan Center portion of LNB, as a user of the bank's services, developed Atlas to try to reduce paper and people costs, William S. Galvin, assistant vice-president and coordinator of Atlas, said.

The bank had been put in a "tenuous position because of the legislative caps on how much it can charge for loans," Galvin said.

LNB used the services of Computer Task Group, Inc., a local software company, to help out the design of Atlas, he said.

The system has been up since last December, working from LNB's Personal Loan Center located in nearby Amherst, N.Y., and communicating credit and discounting information to LNB's IBM 370/135 mainframe over private phone lines at 4,800 bit/sec, Wiles said.

The 370/135 supporting Atlas works in an IBM DOS/VS, Customer Information Control System (CICS) environment, Wiles said, adding that the system "is one large CICS application."

Applications Phoned In

Customer loan applications are usually phoned into the system – which accepts installment loan, Master Charge or line-of-credit applications – from any of the bank's 45 branch offices or area dealers.

The application is entered into the system by an operator with a headset working at one of six IBM 3277 CRT terminal stations in the Personal Loan Office, Galvin said.

Atlas has "disciplined the information coming into the system" so the bank can have it in a certain format, Galvin noted.

The formatting is accomplished immediately after input. Then an on-line credit inquiry is made simultaneously with an on-line search of in-bank active and closed account files over the dedicated lines. The system has a typical response time of 1 to 2 sec, he said.

All of this information is then relayed to a person who reviews it and then enters a decision into the system through another CRT. Any limits or restrictions on the loan are also entered at this time.

The information is then entered into both an IBM 3286 printer terminal and a General Electric (GE) teletypewriter terminal by an operator who is prompted for loan applications which need completion and for format by an IBM 2740 terminal connected to the CPU in Buffalo, Wiles said.

The GE terminal, which LNB "has had for years," communicates a credit inquiry to TRW, Inc. in Anaheim, Calif., he said.

There is no direct interface between Atlas and TRW because of problems on the technical and legal ends, Galvin noted.

Printer Used as Backup

The 3286 printer is also used as a backup device if the system or the dedicated communications lines to Buffalo go down, Wiles added.

Upon approval, Atlas stores the transaction information until receipt of the contract or for a period up to 90 days, Wiles said.

(Continued on Page 25)

FCC Seen Limiting User Choices

Bell Asks Review of Dataspeed Tariff Rejection

By Ronald A. Frank
Of the CW Staff

WASHINGTON, D.C. – AT&T has asked the Federal Communications Commission (FCC) to review the recent rejection of its application to tariff the binary synchronous, clustered version of the Dataspeed 40 [CW, March 8].

The rejection by the chief of the common carrier bureau of the Dataspeed 40/4 CRT terminal will "drastically limit the public's choice of service and equipment," AT&T said.

According to Bell, the rejection included definitions of communications and data processing which are not in keeping with previous FCC findings. "To reach its [decision] the Bureau has created an entirely new and novel definition of data processing which relies on factors unrelated to the functions performed by the Dataspeed 40/4," AT&T said.

Dataspeed 40/4 does not add any new functions to those performed by earlier Dataspeed or teletypewriter offerings and it "simply provides improved ways of carrying out the existing functions," AT&T said.

The proposed tariff for the 40/4 had been challenged by the Computer Business Equipment Manufacturers Association (Cbema), the Computer Industry Association (CIA) and IBM. Cbema told the FCC that the clustering features together with new control keys and the synchronous transmission capabilities of the CRT terminal made the 40/4 primarily a DP terminal that in many ways was similar to the IBM 3270 CRT.

In its latest request for review by the full commission, AT&T said the cluster capability was simply a way that several 40/4s can be connected to one phone line. It did not discuss the intelligent control functions provided by the minicomputer cluster controller in the 40/4 system.

The rejection of the Dataspeed 40/4 was based on the decision that the CRT terminal is an integral part of a data processing service involving the programmed interaction of the terminal and a CPU. If a carrier provides a service which utilizes such equipment, it is performing data processing.

But this definition hinges on whether the messages transmitted by a particular terminal are intended to be directly received by the computer without the need for human intervention, AT&T said. "This is a distinction without any practical significance. A message may be received in a number of different ways and still be transferred immediately to a computer for data processing."

The manner in which a data message is received can vary depending on the desires of the customer and the type of equipment he finds useful, AT&T said. The Bell statement referred to a 1961 IBM document on data transmission terms and teleprocessing products to demonstrate that IBM classifies its terminals as data communications equipment rather than data processing equipment.

Surely it is unreasonable and impractical for definition of data processing to depend upon the way in which a message is received, AT&T told the commission.

According to AT&T, the 3277 CRT terminal from IBM has been described by IBM as "a communicating terminal" despite the fact that the FCC rejection referred to it as the type of equipment which provides data processing.

AT&T said the bureau chief had exceeded his authority in rejecting the 40/4 tariff and it asked that the full commission reconsider the matter and allow the tariff to go into effect. If there are further broad questions to be resolved, an inquiry should be initiated after the tariff goes into effect, AT&T said.

Cbema filed a further response with the commission which said that if the tariff is approved it reserves the right to challenge AT&T's cost justification figures for the CRT terminal.

IBM asked the FCC to extend the time in which it can enter a statement. The FCC extended the deadline for any interested parties until the end of April. After this the FCC staff will submit its recommendation to the commission.

Among the options available to the commission are to affirm the rejection, overturn the rejection, modify the original ruling, or set the matter for hearing. It is not known when the FCC will vote on the matter.

CDI Adds Portable T/S Terminal

BURLINGTON, Mass. – Computer Devices, Inc. (CDI) has introduced a portable time-sharing terminal in its Miniterm line.

Called the Model 1203, the terminal can operate in teletypewriter, typewriter or numeric-only mode at 10-, 15- or 30 char./sec with all modes switch-selectable.

The acoustically coupled terminal has a thermal printer that operates with a 5 by 7 dot matrix character at 80 char./line with 6 line/in. vertical spacing.

The Model 1203 operates in local mode or half-duplex and full-duplex and is available with a buffer memory that allows faster transmission at 120 char./sec.

The acoustic coupler includes a modem that is Bell 103/113-compatible. An RS-232 interface is standard and two- or four-wire current loop interfaces are also available as options.

The terminal prints 96 characters from the Ascii character set and both upper- and lower-case characters can be generated when in typewriter mode.

User features include a lighted print page and provision for a spare roll of paper in the unit's carrying case. The complete unit is said to weigh about 18 pounds.

The Model 1203 costs $2,185 with a one-year warranty. Lease rates for one year are $125/mo, for three years $105/mo and for five years $95/mo. Third-party maintenance is provided by Olivetti. First deliveries are scheduled for July. A receive-only version without keyboard is slated for introduction later this year.

CDI is at 9 Ray Ave., Box 421, Burlington, Mass. 01803.

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(below) *AJ 841*, the rugged Selectronic™ printer terminal. A cost effective replacement for the IBM 2741.

(right) *AJ 230*, a mobile acoustic Teletype terminal. (Also available in auto-answer TWX/DDD versions).
(below) *AJ 630*, a 30 cps quiet, non-impact printer terminal with 140 character print line. (APL is an option.)

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Digital Systems Adapter Links Lear Siegler ADM-3, IBM 3

FREDERICK, Md. – Digital Systems Corp. has an adapter which allows Lear Siegler, Inc.'s ADM-3 dumb terminal to communicate with an IBM 3 computer.

The ISC Model 1 terminal adapter is said to include both the hardware and software necessary to provide two-way communications.

The adapter enables communications to the usually bisynchronous IBM 3 from the asynchronous ADM-3, according to Digital Systems.

Although the ISC Model 1 does not support bisynchronous communications, it reportedly does not interfere with any bisynchronous peripherals communicating with the IBM 3.

Reformat Option

The Model 1's functions include the option of reformatting input by means of field separator characters; code conversion from Ascii to Ebcdic; and conversion from lower- to upper-case letters on input, the company said.

The adapter's features also include the ability to link subroutines to allow RPG-II and Fortran "easy access" to the terminal and the ability to overlap terminal functions with other computer activity, it said.

The ISC Model 1 is priced at $3,950, Digital Systems said from 10 West College Terrace, Frederick, Md. 21701.

In-House Net Keeps Bank's Costs In-Line

(Continued from Page 24)

Declined loans are eliminated from the system and a computer report is made of all necessary data for the preparation of a letter as prescribed by the Fair Credit Reporting Act.

When the completed contract is received from the dealer or branch, the system verifies the annual percentage rate, finance charge, life and disability insurace.

It also computes the dealer reserves, crossfoots the amount financed, indicates the total payments and assigns an account number. If an error in the contract exists, the program identifies it.

Legal Controls

Legal controls are built into the system so that when an entered loan exceeds the legal guidelines of rate, term or proceeds, it will be rejected.

Atlas also provides a report of all applications whether they were approved, declined or qualified. This report data is categorized by branch or dealership and can be refined to reflect an individual salesman's or branch officer's volume and percentage of approved loans.

Cost Savings

Atlas wasn't designed for cost savings per se, Galvin explained, although there are considerable paper cost savings and a savings from the transfer of four employees who had accomplished the checking portion of the credit system manually.

The system has met all of LNB's expectations, Galvin said. There were few problems encountered with the system other than normal start-up problems and minor modifications in the screen format, he said.

LNB is planning to offer the loan authorization system software package to other financial institutions, Galvin noted.

Those interested in Atlas can reach Galvin at LNB's Personal Loan Center, 3275 Sheridan Drive, Amherst, N.Y. 14226.

Board Lets Terminet 120 Run With DG, DCC Minis

MINNEAPOLIS – Customer Systems, Inc. has introduced an interface board designed to allow a General Electric (GE) Terminet 120 line printer to operate with Data General Corp. (DG) or Digital Computer Controls (DCC) minicomputers.

Complete Package

The series 160 interface is supplied as a complete package including controller board, installation instructions and operational and diagnostic software.

The units are fully compatible with the minicomputer manufacturers' software, a Custom Systems spokesman said.

The interface is priced at $750. Custom Systems is located at Suite 170, 2415 Annapolis Lane, Minneapolis, Minn. 55441.

POS Terminal Based on Micro

EL SEGUNDO, Calif. – Revenue Control Sciences (RCS) has introduced a programmable point-of-sale (POS) terminal.

The Model 101 PT can be programmed to function as an electronic cash register or as a financial services, retail merchant or place-of-business terminal, RCS said.

Standard features include an 8-bit microcomputer, real-time clock, 4K bytes of random-access memory (RAM) and 15K bytes of programmable read-only memory (Prom) and read-only memory (ROM) capacity.

Other standard features include an asynchronous communications port, 300 bit/sec modem, 16-position alphanumeric display, 26-key digit/function keyboard, alphanumeric 40-column printer with form-feed logic, external keyboard interface, remote display interface, terminal configuration/address switch, key lock mode switch and power supply, RCS said.

Operator lead-through messages are provided through a 16-position alphanumeric display.

The keyboard/display module may be located up to 24 ft from the printer/CPU module, it added.

Optional equipment includes an electrically operated cash drawer, remote alphanumeric display, remote keyboard, magnetic stripe credit-card reader, Universal Product Code wand reader and a dual floppy disk and controller, according to RCS.

A POS software development system with dual floppy disks, CPU, 8K to 65K RAM and Prom programmer is also available, RCS said.

The standard Model 101 PT costs $2,880, RCS said from 137 Richmond St., Box 868, El Segundo, Calif. 90245.

The *Silent 700* ASR Data Terminal. It shares time with good company.

The twin-cassette *Silent 700*® Model 733 ASR data terminal from Texas Instruments is supported by every leading U.S. timesharing service company, a few of which are indicated here.

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The Model 733 ASR lists for $2895*, including printer and twin cassettes. Attractive lease rates are available. And it is backed by worldwide TI service and support.

For more information, contact your nearest TI office. Or write Texas Instruments Incorporated, P.O. Box 1444, M/S 784, Houston, Texas 77001. Or call 713/494-5115, extension 2124.

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Gamma Software Using Hasp Protocol Turns DG Nova Mini Into RJE Terminal

PALO ALTO, Calif. – Gamma Technology has introduced a program which is said to turn a Data General (DG) Nova minicomputer into a remote job entry (RJE) terminal using the advanced IBM Hasp workstation transmission protocol.

The program reportedly supports all the features of IBM's multileaving binary synchronous communications (BSC) workstations, including full compression of blanks and repeating characters in both transmitted and received data, transparent data transmission, character recognition code (CRC) checking, multiple I/O stream capabilities and operator console support.

The software supports transmission efficiency through the use of a technique which permits data to be transmitted with acknowledgement messages, Gamma said. The program also interfaces with DG's RTOS or RDOS monitors so that any peripheral supported by those operating systems can be utilized as an input or output device, it added.

Data from disk, magnetic tape or cassettes can be transmitted to a central IBM system, and output print and punch files can be stored on disk or tape for later processing, according to the company.

Under RDOS, the program can reside in either the foreground or background partition.

The minimum equipment required to run the program is a Nova with 12K words of memory and a real-time clock, operator console, 4074 synchronous adapter, an input device, an output device and a modem.

The one-time license fee for the program is $2,500, which includes binaries on magnetic tape, an instruction manual and one year's maintenance. Source code and card bootstrap decks are available, the company added from 800 Welch Road, Palo Alto, Calif. 94304.

Infotron Port Selector Can Serve Multiple CPUs

PENNSAUKEN, N.J. – Infotron Systems Corp. has added an automatic computer select (ACS) feature to its Timeline 450 computer port selector.

The ACS feature allows one port selector to serve multiple CPUs – the user makes the choice via his terminal keyboard, the company said.

The port selector is said to extend CPU terminal-handling capability by putting incoming lines in contention for whichever ports are available, rather than dedicating ports to lines which may not be in use. Any mix of local and distant lines are accommodated, Infotron said.

The 450 is also useful when the port limits of an existing front end have been reached – it will put up to 254 lines in contention for up to 124 ports, the company added.

With a port selector, all callers can use the same phone number, reducing telephone equipment costs, a spokesman said.

In a multiple CPU environment, the caller selects a CPU by hitting a key on his terminal and the Timeline 450 with ACS makes the connection, the company explained.

The port selector connects the incoming call to the first available port in the desired computer and passes the ABR character to the front end. The ABR feature recognizes transmission speeds of 110-, 134.5-, 150- and 300 bit/sec, Infotron added.

There are two standard 450 port selector base units, the TL450/1608 and TL450/3216. The capacity of either can be increased by using expansion nests. Infotron said.

The cost of the added features begins at $5,000, the spokesman said from 7300 N. Crescent Blvd., Pennsauken, N.J. 08110.

Compact Ann Arbor KSR, RO CRTs Feature Upper- and Lower-Case Set

ANN ARBOR, Mich. – Ann Arbor Terminals, Inc. has introduced what is said to be a compact CRT terminal in keyboard send/receive (KSR) and receive-only (RO) versions.

The K2050 KSR terminal and the R2050 RO terminal incorporate a 20-line by 50-character display format with an upper- and lower-case 96-character Ascii code set, the company said.

The K2050 has an RS-232 interface as standard equipment; 20- or 60mA current loop and total transistor logic (TTL) interfaces are optional.

Eight transmission rates from 110- to 9,600 bit/sec are also available as options on the KSR terminal.

The R2050 comes with a parallel TTL interface for transmission rates up to 1,200 char./sec as a standard feature, according to Ann Arbor.

Characters are written on a 7 by 9 dot matrix format in a 10 by 12 dot field on both units.

Command functions on the terminals include erase screen, line feed and carriage return. Cursor positions are right, left, up, down, home and X-Y positioning, it noted.

The R2050 and K2050 terminals cost $1,170 and $1,675 respectively, the firm said from 6107 Jackson Road, Ann Arbor, Mich. 48103.

Study to Detail European Tariffs

Special to Computerworld

LONDON – The problem of unraveling the complex tariff structures for European and Europe-U.S. telecommunications may soon be eased.

The rates for telephone, Telex, and data communications within and among the 17 major European countries and between these countries and the U.S. vary widely.

But now details of tariffs and services will be made available in one publication by Logica Ltd.

The company reportedly is surveying telecommunications services, and the first volume of the results is scheduled to appear in September. Cost to initial subscribers will be about $3,800.

The survey will be updated to reflect new developments and cost changes, the firm claimed.

Logica Ltd. is at 64 Newman St., London W1P 3PG, England.

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Hendrix OCR Page Reader Available for $11,500

MANCHESTER, N.H. – Hendrix Electronics, Inc. has introduced an optical character recognition (OCR) page reader priced at $11,500 for data entry and word-processing applications.

The OCR-2 unit can be operated as a communications terminal, the firm said, or interfaced to existing remote data systems.

At present the unit has the capability to read OCR-A and OCR-B characters at a rate of 220 char./sec, the firm said.

Hendrix is at 645 Harvey Road, Manchester, N.H. 03103.

Booklet Discusses Security Pitfalls

NEW YORK – Bonded Services has published a free 12-page booklet which details the security limitations and other shortcomings of records storage facilities for the protection of vital records and data media.

Most on-site records storage facilities are designed primarily as repositories for frequently used records and DP media, not for the secure protection of irreplaceable information media, according to the "Information Security Primer."

While not disputing the security of bank vaults, the primer suggested vaults lack essential environmental controls for DP media, noting data withdrawals are time-consuming and records are usually inaccessible after banker's hours.

Commercial warehouses, the brochure added, may be a low-cost alternative for basic records storage, but often lack appropriate environmental controls, security safeguards and support services for data media.

The optimum protection facility should be off-site and managed by full-time information security professionals. It should also be protected against natural hazards such as fire and magnetic fields and provide essential support services, the primer stated.

The primer is available from Bonded Services, Department D2, 733 Third Ave., New York, N.Y. 10017.

Seventh Amdahl 470 Installed

CINCINNATI – The seventh Amdahl Corp. 470V/6 has been installed at the Southwestern Ohio Regional Computer Center, a service bureau here.

The system was operational 35 hours after it was delivered, the center said.

The 470V/6 performed 70% faster than the center's 370/168 in benchmark tests, the center's director claimed.

Survey of Users, Dealers Finds

Univac Nears HIS in Used Gear Policies

By Nancy French
Of the CW Staff

Univac's policies toward users of used equipment are only "somewhat less" restrictive than those of Honeywell Information Systems (HIS), a recent survey of users and used equipment dealers showed.

As a result, few users are willing to risk the difficulties that can arise in installing and operating used systems despite the money they could save, the survey found.

The harshest criticism leveled at Univac by those interviewed concerned precertification for maintenance.

One user who bought two tape drives from a used equipment vendor complained that, after Univac inspection, $3,000 worth of labor and parts were put into the equipment to qualify it for a one-year maintenance agreement.

The drives had been warehoused for 20 days and, prior to removal from the first owner's site, had been under continuous Univac maintenance, he said.

Users who elect to do their own maintenance or contract for third-party service are not permitted to retain vital maintenance documentation when they obtain a used system, they said.

However, neither users nor vendors reported serious difficulties with operating systems, and the survey found no license fees assessed for their use.

Several vendors who do business nationwide said Univac's policies are "inconsistent" from region to region. They attributed the inconsistency to the fact that each regional service center is a separate profit center and must be concerned about the profit implications of its policies.

A Univac spokesman, however, denied any inconsistencies in policy, but admitted the company has "no formal policies" on some of the issues raised by those surveyed.

As for operating systems, however, the spokesman said "a system is a combination of hardware and software and it is fundamentally the responsibility of the manufacturer to supply this."

Since "an operating system is typically on a reel of tape," if a system is sold and an operating system goes with it, "it's there" for use by the next owner, he said.

In cases where a system is three or four years old, however, and the original owner sells it to someone else, the new owner would have to "come back to the original manufacturer for improvements issued since the original purchase.

"If this happens, then you have to pay for it," he said.

Few Upkeep Problems

Users who sign maintenance agreements with Univac seem to have few problems. For example, Don Groetzinger of Western Publishing in Racine, Wis., said Western "enjoys a fine level of service on all its equipment."

Western has bought equipment "wherever I can get the right price," he added.

Noting he did buy "quite a bit of equipment from Univac" initially, Groetzinger praised Univac's maintenance and additional courtesy of inspecting used equipment before he had to commit himself to a purchase.

"Usually we have Univac make an inspection of any equipment before I make a firm offer. Charges are usually minimal, based on the time involved," he said.

"I bought a 9300 down in Tuscaloosa, Ala., for example, and [Univac] had to drive in from Huntsville to examine it, so naturally I paid the mileage charges and so forth – nothing different from what you would expect. [Univac] gives you a good shake," he said.

Bill Grinker of American Used computers said Univac reserves the right to inspect equipment before maintaining it and occasionally comes up with charges associated with recertification of equipment for maintenance agreements.

"Univac charges less than $30 per hour" compared with HIS' $95; parts are "expensive but not unreasonable," he said.

Can Lease Documentation

A Univac spokesman expanded on user experience, explaining users who don't wish to sign maintenance agreements with Univac may lease necessary documentation from Univac on an annual basis. Charges start as low as $100/year, depending on the type of system.

"This policy is not stated in the maintenance agreement because the user doesn't have control over documentation," he said, "but if someone comes and asks us for documentation, we will send him a contract with charges based on a fixed price list."

Users who are located far from a Univac maintenance base and are subject to a surcharge for field engineers' travel to the site take advantage of this offer, he said.

Depressed Prices

Since only the most experienced DP manager or one who is actually spending his own money – the president of a service bureau, for example – wants to risk hassles with maintenance and spare parts, prices of used equipment are extremely depressed, one vendor said.

Univac's 9000 series equipment is selling for about 10% to 14% of its original cost, he observed.

But the low prices can work to the advantage of users who have in-house maintenance skills. Many buy used systems for spare parts, thus avoiding delivery time for spares when they are needed.

One vendor said Univac makes a distinction between its used RCA gear and the old Univac equipment. He said he has found the firm much more aggressive in enforcing its policies on old RCA gear because, "I presume, it's trying to kill off the Series 70 line and encourage users to bridge over into the 9000 series."

Cummins-Allison Keyscan 3400 Handles Remote Processing Jobs

GLENVIEW, Ill. – The 3400 Keyscan system, a key-to-disk or multimedia system for remote processing operations, is available from Cummins-Allison Corp.

The 3400's memory can range from 48K to 130K bytes; 2.45M- to 9.8M bytes of disk storage are available, Cummins said.

The Keyscan supports two to eight CRT keystations, a magnetic ink character recognition (Micr) document reader/sorter, a card reader and 125- or 250 line/min printers, the company added.

IBM-compatible 2780, 3780 or 2968 communications packages are available, a spokesman said.

The system can perform data entry and front-end processing on-site and can communicate with a Cummins 4400 Keyscan system or mainframe, Cummins said.

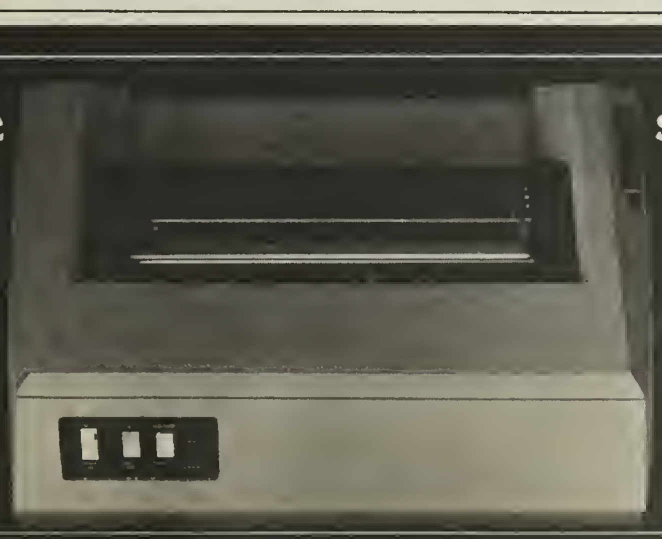
"With the 3400 system, a company can install data entry systems in remote departments or branches for any general entry applications. All processing and report generation can be performed on-site prior to transmitting data to the host 4400 system or mainframe," Cummins claimed.

Two-Station Price

A two-station Keyscan with a 48K-byte processor and bisynchronous communications rents for $860/mo on a 24-month lease or can be purchased for $31,355.

A multimedia system with a reader/sorter and one CRT keystation with printer rents for $2,970/mo. The purchase price is $118,065.

Cummins-Allison is at 800 Waukegan Road, Glenview, Ill. 60025.



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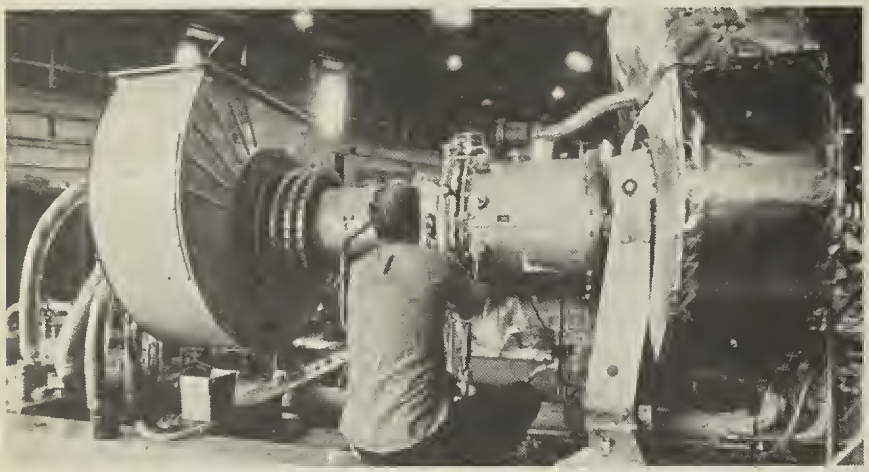
System Designs Turbines to Tap Energy Resources



A computer is used to custom-design gas turbine systems used at oil and gas fields in some of the most rugged and isolated places on earth.

SAN DIEGO – Efficient, lightweight gas turbine systems that are designed by a computer and run on raw gas and crude oil are helping ease the task of tapping energy resources in remote oil and gas fields.

The turbine systems, manufactured by the Solar Division of International Harvester, headquartered here, drive compressors and pumps at such isolated and inhospitable spots as Alaska's North Slope, the North Sea, Siberia and the Mid-East deserts. Powered by the raw fuel they help extract, these simple and rugged turbines are replacing older, conventional engines that require refined fuel and greater maintenance.

To assure that turbine systems will deliver maximum efficiency at drilling locations, Solar uses an IBM 370/158 to aid in their design.

"Oil companies provide us with information on the tasks to be performed and the conditions they expect to face in the field," Robert E. Hattrup, manager of systems and data services at Solar, said.

"Pumping requirements vary according to temperature and altitude at the site, density of the crude oil, length and diameter of the pipeline, volume needs and other complex factors," he added.

The system is used to analyze the information and then help custom-design turbine systems by determining the combinations of pumps and compressors best suited for each particular installation, he said.

A turbine burns a compressed mixture of air and fuel to create hot gases, which spin rotor blades that turn the turbine's shaft. Gas turbines first were designed in ancient Greece more than 2,100 years ago, but were not perfected for industrial use until the mid-1960s.

"In addition to searching for new oil and gas deposits, many petroleum firms are returning to older fields which they abandoned years ago," Hattrup said. "When the oil and gas stopped flowing under its own pressure, the companies left the fields even though there were substantial amounts remaining.

"Now they're using our turbines to pump in gas or water to force the rest of the petroleum out, to help ease the energy crisis."

Solar has manufacturing and warehousing facilities throughout the world. The company's computer keeps track of both production models and spare parts, eliminating the chance of one facility falling behind in filling orders while another stockpiles inventory.

The system also schedules manufacturing of components and assemblies for the turbines.

VGI Releases Interactive 3-D Graphics Unit

WOODLAND HILLS, Calif. – Vector General, Inc. (VGI) has introduced what it said is its next generation of three-dimensional (3-D) interactive graphics display systems.

The 3400 is a direct-writing system capable of displaying 3-D graphics and alphanumerics with speeds up to 20,000 .1-in. vectors at 30 Hz, the company said.

The system employs a proprietary vector generator unit operating with buffer registers to minimize data access delay time and features a graphics processing unit (GPU) with microprocessor for fast data transformations, VGI said.

The standard 3400 GPU firmware includes perspective, windowing, clipping and zooming.

The GPU is microprogrammed with 47 user instructions, has a 4K-word control program, 16 general-purpose accumulators, 17 special address registers, a 247-word read-only memory (ROM) constant file and a 248-word random-access memory (RAM) data file, the company said.

The CPU is capable of circle/arc generation, 3-D transformation of all elements and cubic and rectangle synthesis, it added.

The 3400's refresh buffer unit has a capacity of 32K words of storage at a 16-bit word length and a 1-μsec access time.

The 3400 is usually front-ended with a minicomputer to accomplish data communications, he added.

The 3400 display is supported by the Vector Graphics Access Method (VGAM), a company-developed macro-oriented handler that is said to facilitate efficient graphics resource management.

VGAM was designed to ensure the operating integrity of each graphics task and the independence of each user station.

One 3400 display generator can support four CRTs and four sets of interactive devices, the spokesman said.

The purchase price for a typical configuration is $51,500 and includes the 3-D perspective, off-line high-speed digital transformation and display; 16-bit, 16K-bit-word refresh memory; font generator with ROM; 96-character Ascii set; a 21-in. display monitor and light pen; and one CRT workstation, the company said.

Deliveries are scheduled to begin in May, VGI said from 21300 Oxnard St., Woodland Hills, Calif. 91364.

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The goal of this seminar on **How to Increase Programming Productivity Through Software Engineering** is simple: more cost effective and reliable software through improved analysis, design and implementation methods. We call it "Software Engineering", and it's a topic that has become more and more important as software costs escalate. Right now, for example, it is not all unusual for the cumulative cost of software development, maintenance and enhancement to match or even exceed the total investment in hardware over the course of a system's life.

How to Increase Programming Productivity Through Software Engineering wil give you the information you need to evaluate the new Software Engineering methods receiving widespread attention as they apply to your organization. This includes Structured Programming, Structured Analysis (TM), top-down design, implementation and testing, and new approaches to managing the development process. The seminar will also enable you to evaluate the effect these new methods will have on your operation and management style.

Attention will be focused on the high leverage areas, especially methods for improving the analysis and design process. A recent Department of Defense survey showed that 64% of software errors tend to be hidden ones, and do not surface until late in the development cycle. Over half the total errors remained hidden until acceptance testing or later. Of these hidden errors, 83% were in analysis and design. These statistics emphasize that Structured Programming alone is no substitute for the structured approach to the entire development process to be stressed in this seminar.

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The course is designed for managers. It does not get involved in the technical detail you will find in the large number of courses designed for programmers on new methods. When you have completed both days of intensive instruction and question and answer sessions, you'll have what you need to start using the methods and tools which can significantly improve the reliability and cost effectiveness of your software while increasing user satisfaction. Especially important — you'll know how to avoid the pitfalls that have trapped the innovative but unwary manager.

John W. Brackett, PhD and Prof. Clement L. McGowan are the Seminar Leaders

John W. Brackett, PhD is a founder of SofTech and is a company Vice President responsible for the development and application of improved analysis and design methods. Dr. Brackett has been a consultant to several major computer manufacturers on new program development techniques for improving programming productivity. He has presented this seminar to many large industrial and government organizations, including ITT, MITRE, United Technology, the U.S. Navy and U.S. Air Force. Together with Dr. McGowan, he developed a new graduate-level course in Software Engineering at Brown University.

Clement L. McGowan, PhD is a consultant to SofTech, and is an Assistant Professor of Applied Mathematics at Brown University. Dr. McGowan co-authored the recently published book, *Top-Down Structured Programming Techniques*. He has been a consultant to the IBM Federal Systems Division responsible for the development of many of the new methods currently receiving widespread attention. He is an associate editor of the *Journal of Computer Languages* and is a member of the IEEE Computer Society, ACM and Sigma Xi.

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The charge for the entire 2-day seminar, including continental breakfasts, luncheons and all course materials is $300. Additional registrants from the same company are charged only $250. This does not include hotel rooms, if necessary, but we have reserved space at seminar hotels for attendees who wish them.

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Mini Bits

Mini/Midi Systems Focus Of May Decus Symposium

MAYNARD, Mass. – The Digital Equipment Computer Users Society (Decus) will sponsor a Mini/Midi Symposium May 25-28 at the Omni International Hotel in Atlanta.

Six parallel sessions on each of the four days will focus on 18-bit systems and graphics and biomedical applications, Decus said. Attention will be given to Mumps, RSX-11, RSTS, RT-11 and OS/8 operating systems.

Capt. Grace Hopper, head of the U.S. Navy Programming Languages Section, will be the keynote speaker, Decus noted from Maynard, Mass. 01754.

Controller Handles 3M Tape Drives

MINNEAPOLIS – The Series 220 controller for 3M cartridge tape drives is available for Data General Corp. (DG) and Digital Computer Controls (DCC) minis from Custom Systems, Inc.

The basic controller, which costs $1,250, can handle up to four 3M drives, the firm said, providing backup capability for disk-based minis.

The controller is available from the firm at 2415 Annapolis Lane, Suite 170, Minneapolis, Minn. 55441.

Graf/Pen Linked to HP Calculators

SOUTHPORT, Conn. – Science Accessories Corp. (SAC) has introduced interfaces to link its Graf/Pen with Hewlett-Packard (HP) programmable calculators.

The Graf/Pen is a sonic digitizer that converts graphic information into digital for processing, recording or transmission.

The pens are both hardware- and software-compatible with the calculators, the firm said.

The models 1491 and 1492 interfaces for the HP 9815 and 9825 calculators respectively cost $1,195 while the Model 1485 interface for the HP 9810, 9820 and 9830 costs $1,200 from the firm at Kings Highway West, Southport, Conn. 06490.

Monolithic Cuts Monostore Costs

ENGLEWOOD, Colo. – Monolithic Systems Corp. has reduced prices on its Monostore V memory system for Digital Equipment Corp. PDP-8A, -8E, -8F and -8M minis.

Single-quantity prices now are $438 for a 4K system and $695 for an 8K system.

Previously, the 4K board cost $560 and the 8K board $995, the company said from 14 Inverness Drive East, Englewood, Colo. 80110.

Advanced Planning Crucial

Vendor-Independent Distributed DP Seen

By Esther Surden
Of the CW Staff

BOSTON – Users are seeking a "vendor-independent" way of configuring distributed processing networks, Hal B. Becker of Honeywell Information Systems said here recently.

Requests for proposals often omit significant elements and are ambiguous, which can lead to network planning error, he told a group at Minisystems '76, a two-day, Honeywell-sponsored conference.

Users need a concrete way to determine a network and predict the performance of a particular configuration, he said.

"It is also time to get rid of the 'vanishing problem syndrome,' " Becker added. Network design sometimes takes up to 18 months to complete, and during that time the user's business requirements can change. A way to deal with this situation is needed, he said.

The three elements of a distributed processing network include the system's information-processing functions, network-processing functions and data base functions, Becker said.

Information processing is the manipulation of data to produce desired results; network processing is the movement of information between various nodes in the network; and data base functions store information in forms appropriate for the user, he explained.

Remarking that data base is often considered part of the information-processing function, Becker said that "if the distributed environment is going to happen, it will be more efficient to bring data base out of information processing and manage it at an equivalent level."

Any network is a combination of these three function sets, Becker said. The task is to select appropriate subsets of the function sets and integrate them into a system.

The physical function subset consists of hardware devices that perform the movement and storage of data and logical functions that control the flow of information through and between the physical functions, he noted.

Six Areas to Consider

The user requirement statement should consist of six basic areas, Becker said. Users should furnish the "topology" of the proposed network, telling what city, country or continent is involved.

In addition, some indication of the volume of data to be handled by the network – including a distribution profile that answers the question, "From a given point, what percentage of the characters go where in the network?" – is needed, he said.

A statement of information-processing requirements would also include the physical configuration of each computer and specific response-time requirements for the system to be effective.

The network's availability should also be considered, Becker said. If the network is to be available 24 hours/day, a great deal of redundancy must be built in, he said.

In the analysis and design of a system, it may be necessary to repeat the steps until a workable network is developed, Becker said.

This is an interactive process because it takes a combination of automated algorithms and manually derived decisions to come up with a workable solution, he added.

The first step is to take the requirement statement previously developed by the user and build a file in a random-access storage media, he said.

The users can then take the physical and logical design and come up with a candidate configuration. The configuration is then modeled until it reflects acceptable performance.

The fourth step involves the installation of the final configuration, running various programs against the files to produce equipment lists, identification of carrier facilities, etc.

The actual measured performance of the network is then compared with the predicted performance. After the entire network is implemented using this sequence, users can easily update the configuration to reflect desired changes that have taken place during the 18-month implementation time frame, Becker said.

Compuvote Micro-Based System Reckons Precinct-Level Votes, Transmits Tally to Central CPU

By Nancy French
Of the CW Staff

BEVERLY HILLS, Calif. – Compuvote Corp. has introduced a microprocessor-based on-line precinct election system that is said to combine the immediacy of instant vote tallying at the precinct level with the permanence of stylus-punched cards.

The results of many card-oriented voting systems must be transported from the precinct to a central DP installation for tallying, a company spokesman said. The Compuvote system stores voter choices in a microprocessor memory in each precinct; when the polls close, elections officials can send the results in binary code over voice-grade lines to the central computer where they are registered and added to tallies from other precincts, he said.

The punched cards can then be stored in locked boxes and retained as an audit trail in the event of a recount. Overvote protection is built into the software, the spokesman added.

A voter makes his choices by punching a card with a stylus provided in each booth. An electromechanical interface built into a conventional Computer Election System (CES) Votomatic punch card vote recorder captures the votes in a temporary buffer.

When the voter has completed his candidate selection, he presses a "vote complete" button and the votes are tallied into the permanent random-access memory (RAM) inside the control console on the precinct official's desk.

If the voter changes his mind midway through his voting or makes an error, he may request a new punch card ballot and revote, since his votes are being held in the system's temporary RAM, the spokesman said.

When the polls close, a summary tally is printed out in each precinct on a paper tape for local certification and posting.

Tallies can then be sent to a central computer via dial-up, voice-grade telephone lines.

The micro-based system employs an Intel 4004 CPU with 1.5K bytes of programmable read-only memory and 512 bytes of RAM. This system permits 256 voting positions, up to 4,000 voters and four Votomatic vote recorder terminals at each precinct.

A built-in LSI crystal-controlled acoustic coupler drives a speaker cup that fits over a standard telephone handset for transmission in either Ascii or cryptographic code at 110- or 300 bit/sec rates, the vendor said.

The precinct drum printer operates at 162 line/min using standard accounting paper tape.

The system, which includes a control console, microcomputer, modified CES vote recorders, printer, modem and system power supply costs less than $3,000 per precinct," Compuvote said from Suite 310, 9171 Wilshire Blvd., Beverly Hills, Calif. 90210.

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Selecting a Mini — Part 4

Maintenance a Two-Part Consideration

By Robert E. Berkman

Special to Computerworld

Maintenance refers to the responsibility of the vendor to fix problems that may arise after a system is installed.

It can be viewed in two parts: hardware maintenance and software maintenance.

Hardware maintenance is generally supplied by the manufacturer. In cases where a systems supplier has put together a system made up of various manufacturers' components, either the system supplier or an independent maintenance organization will provide maintenance.

Hardware maintenance terms should be checked carefully. With an in-house system, downtime often severely impacts day-to-day business. One must therefore make sure the equipment can and will be fixed rapidly.

Maintenance should be provided from a nearby facility. In addition, the maintenance facility should have sufficient spare parts to alleviate the need to secure parts from a distant warehouse location.

This is the fourth in a five-part series on the selection and evaluation of business minicomputer systems. Next week's article will cover some final considerations.

An adequate staff should be located at this facility so response time on calls is kept to a minimum. Other users' experience should be checked in terms of responses to maintenance calls.

Another safety factor is the availability of a backup system to handle the processing in the event of extended outage.

Software Upkeep

Systems software maintenance generally will be provided by the hardware manufacturer. The software vendor will provide applications program maintenance.

Some turnkey vendors have modified a manufacturer's system software and therefore must provide system software maintenance themselves. Once the software has been modified, it should be considered new software, and therefore, the installations using the manufacturer's software do not represent the actual number of implemented systems.

Also, the number of of people knowledgeable in the system software should be considered. It is risky if only one or two people understand the software thoroughly.

Extra Dimension

If the user has selected the list of vendors carefully, he will probably come up with several that can do a good job of implementing the system he wants. With this in mind, an extra dimension must be added to his evaluation.

This extra dimension is risk analysis, made by hypothesizing situations that could develop in the user's relationship with the supplier.

One possibility is that the supplier will go out of business. Based on the events of recent months, it is evident this possibility exists even with large suppliers.

A significant number of hardware manufacturers, turnkey vendors and software companies have not been able to sustain themselves economically and have withdrawn from the marketplace. The financial credentials of all potential vendors should be checked carefully.

In some cases, even though the company has stayed in business, the client has found it is not to his best interest to continue his relationship with the supplier.

One must be protected from total breakdown of the DP facility if either of these events should take place.

If the equipment bought is from a manufacturer with a great number of installations, the risk of not being able to get maintenance is reduced.

First, there is a pretty good chance the installation base will be picked up by another manufacturer who will provide the maintenance.

Second, organizations specializing in computer maintenance could be a resource for the user. This will have an impact, however, on the ability to upgrade configuration to meet company growth. If the hardware is no longer manufactured, it may be difficult to get additional components at a later date.

When a configuration consists of various manufacturers' components, the maintenance problem is even greater. While the user probably will be able to get a maintenance organization to service him, the costs will be very high.

In addition, very few people within that organization will be well trained in all aspects of the hardware to be maintained.

The maintenance of system software and applications software must also be considered. If the manufacturer's standard system software is used, the user has a much better chance of securing maintenance than he will have with an operating system developed by an outside source.

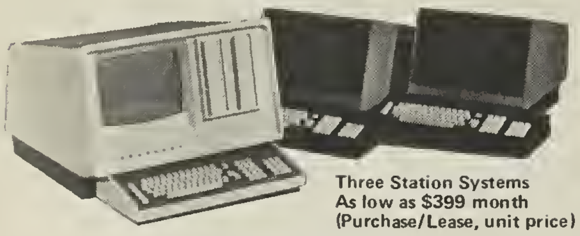
If applications programs are written in a common language, maintenance should be no real problem.

The user will find significantly fewer people who can maintain a system in Assembly language.

New languages developed by system suppliers are generally only known well by the employees of that company and provide the greatest risk.

In any case, the user should make sure he is supplied with complete documentation.

Berkman is president of Robert E. Berkman Associates, a Ridgewood, N.J., consulting firm specializing in selection and installation of small business systems.



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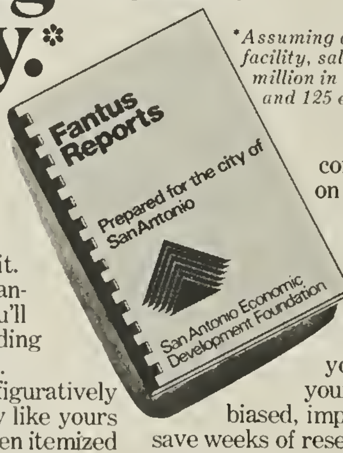
Fantus Reports
Prepared for the city of San Antonio
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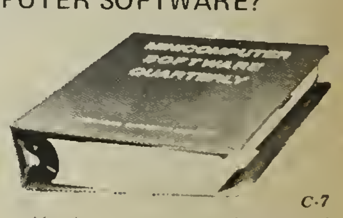

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Mini Simulates Gamut of Conditions to Test Engines

By Marvin Zalevsky

Special to Computerworld

PITTSBURGH, Pa. – With federal emissions requirements and the energy shortage, dynamometer testing of gasoline engines has become more sophisticated. With this sophistication has come the need for minicomputer control.

For many years the dynamometer has been the standard instrument used by automotive engineers to perform gasoline engine testing and analysis. Tests were usually conducted at full throttle and results were concerned mainly with maximum performance and durability.

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In addition, meaningful efforts toward improving emissions levels and fuel economy require that parameters such as air fuel ration, spark timing, exhaust gas recirculation (EGR) flow rate, speed and load be adjustable.

At Essex, a United Technologies subsidiary, which has dynamometer facilities at its Pittsburgh Division, the time-consuming manual operations involved were threatening to slow the production of valid data down to a trickle.

To cope with this, Essex constructed a minicomputer-managed dynamometer facility by adding some special engine-controlling hardware and a minicomputer to the basic dynamometer apparatus. The mini is a 32K Data General Corp. Nova 1220, and the program is written using multitasking Fortran and Assembly language.

The operator has a set of panel-mounted instruments including displays and controls for speed, load, air/fuel ratio, EGR percentage, mass air and fuel.

The air/fuel ratio for the engine may be held to a constant by an operator command. This means the operator may vary speed load, spark timing and EGR flow rate, and the system will adjust the fuel flow as required to maintain the given ratio.

Enhances Testing

With this equipment, much critical testing can be done which was not previously possible. An operator command has been added to open or close injectors to each cylinder, and timing and logic circuitry allows operation under sequentially timed or simultaneous fuel injection modes.

Data from the engine may also be averaged by the mini over a given time period to eliminate "spikes" which may occur. Temperature and pressure guages attached at critical places on the engine provide the computer, and in turn the operator, with more information on engine activity. Also monitored are emissions data and fuel consumption.

The information gathered is used to update the display devices on the operator panel and to give the computer feedback on engine conditions. When the operator has set the engine to the given experimental parameters, he issues the command to record the data, whereupon the system collects all the data it has, including readings on the operator control panel, and transmits this to a direct-connected Interdata 7/32 system where the results are stored for further analysis. It is not unusual for over 15,000 lines of data to be transmitted during a working day.

The results of this work include a large data base which may be used to examine the characteristics of the engine being tested. Hopefully, the data will indicate what happens to emissions and fuel consumption at varying air/fuel ratios, how spark timing can be used to decrease fuel consumption, etc.

Zalevsky is a senior programmer at Essex.

Guide Analyzes 40 Small Units

PENNSAUKEN, N.J. – The *Auerbach Guide to Small Business Computers*, intended for comparison shoppers, analyzes 40 small business systems in depth and gives specifications for over 230 systems, according to Auerbach Publishers, Inc.

Current pricing information, user reactions to each product and a checklist guide for the buyer are included in the 275-page paperback book, Auerbach said.

Covered in the guide are such products as the BSL Northrup BDS series, General Automation DM 100 and DM 200, IBM 5100, System 32 and 3/12, Martin Wolfe Mesa Two and NCR 399.

A checklist designed to help the user during the evaluation and selection procedure covers the corporate background of the firm with which he is dealing, names of references and questions to ask references.

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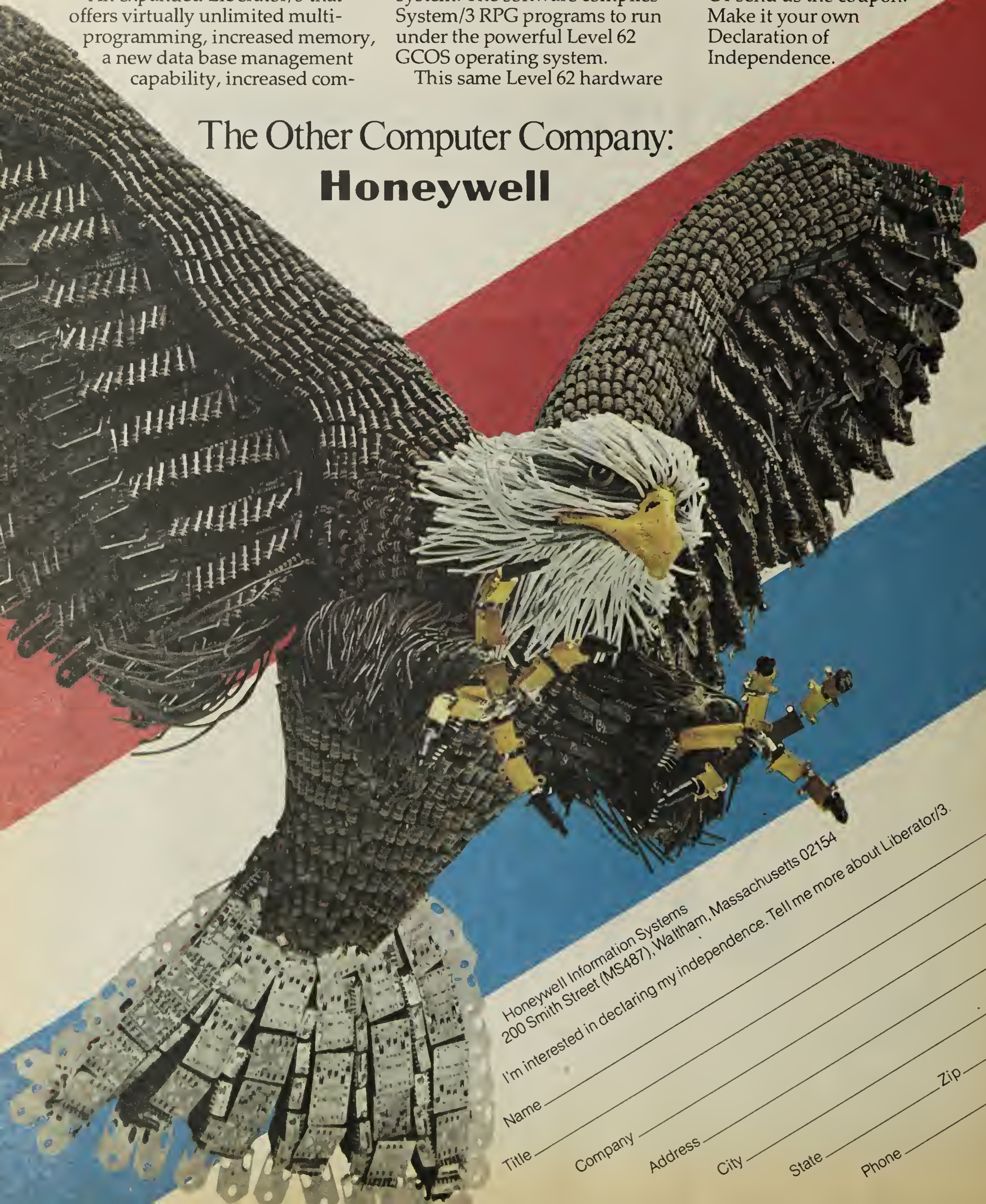

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Welke Notes User Attitudes

IBM Unbundling Cited as Software Industry Impetus

By Edith Holmes
Of the CW Staff

NEW YORK – Unbundling encouraged the growth of independent software companies by changing user thinking toward software, the president of International Computer Programs, Inc. (ICP) indicated in recent testimony before the court hearing the U.S. vs. IBM antitrust case here.

IBM's 1969 move to price hardware and services separately provided users with the "seal of approval" they needed to consider software written by independent vendors as an alternative source of programs, Larry Welke said.

Approval was necessary – even though IBM itself could not be called a major competitor in applications packages – because users were writing 90% of this software themselves, he said.

Various other factors also contributed to the growth of the software industry, he stated.

Welke implied, however, that the software marketplace grew more directly from the constant shortage of technicians in the field and the increasing importance of software to computing in general than it did from IBM's unbundling.

The marketing change helped users identify their software costs, he suggested, and recognize their ability to look for alternative sources of programs with a view toward decreasing DP expenses overall.

In addition, unbundling encouraged users "to consider software a product," he said. Welke was the first of the five government witnesses scheduled to testify on IBM's conduct in the area of separate pricing.

Bundling Retarded Efforts

Prior to the 1970s, bundling acted to retard independent software firms' efforts to sell software on that basis, Welke observed. Users didn't buy outside software during the 1960s in part because no one was seriously selling it, he said.

Bundled prices served to cloud users' perceptions of the costs of software and other services in the 1960s, Welke said. They were getting everything they needed for a single price; there seemed no need to look elsewhere, he remarked.

At the same time, users wrote nearly all of the applications programs and today remain the authors of 80% of it, the ICP executive added.

Computer systems manufacturers as a whole have never generated more than 10% of all available software; neither have they employed more than 10% of all programmers and systems analysts, according to Welke.

Specifically, "IBM has never been a major competitor in applications software," he said, adding separate pricing had little effect on that business.

However, the corporation is much more competitive in systems software because it relates directly to account control and IBM's ability to sell hardware, he suggested.

Welke said he couldn't see why IBM would be hurt by or concerned about the growth of independently supplied software except to the extent that more efficient outside software would suggest to users they could minimize the amount of IBM equipment in their shops.

The software industry has clearly grown in the years since unbundling, Welke testified. From $20 million to $25 million in 1969, revenues generated by independent software vendors alone jumped from $45 million in 1970 to $750 million in 1975.

Contract programming reached a high

(Continued on Page 37)

IBM Cites Payments, Sees Japan Threat

By Nancy French
Of the CW Staff

PHOENIX – Payments made in violation of IBM policies have totaled $53,000 over the years, but none were made to obtain business for IBM, Chairman Frank T. Cary told stockholders at the corporation's annual meeting here last week.

The payments were made in two countries, which Cary would not name. The largest payment was for $25,000; another for $6,000, was made to protect the safety of an IBM employee, he said.

On another topic, Cary remarked the firm faces tough competition in 1976, although recent products hold the promise of much new business. He cited particularly the Japanese government's efforts to bolster its DP industry.

"The Japanese government has joined forces with that country's DP industry to make DP products a major export industry," he said, calling this reminiscent of the way the Japanese expanded their automobile and ship-building industries.

Turning to prospects for the year, Cary said "a solid, steady" economic recovery already felt in the first quarter, combined with a "moderation of inflation," are the signs of another good year for IBM.

The order rate for DP equipment during the first quarter of 1976 increased "significantly" over the first quarter of 1975, he told the approximately 1,000 of the firm's 590,000 stockholders who attended.

Four Infractions

Detailing the payments, Cary said there were four infractions of IBM's policies and business conduct guidelines that prohibit bribes and political contributions "even in countries where they are legal."

Cary observed there were only four cases of violations despite IBM's roster of more than 290,000 employees in 127 countries.

In each case, disciplinary action was taken: two people were fired and one demoted, he said.

No Word on Court Costs

Cary dismissed the matter of antitrust suits in a few words and refused to tell stockholders how much IBM has spent defending itself against antitrust charges or to break down legal costs.

Such information would not serve the interests of the corporation or the stockholders, he said, and would help IBM's adversaries by revealing the level of importance IBM is placing on any individual suit.

The government's antitrust suit against IBM, which began in May 1975, is "moving ahead at a very slow pace," Cary said.

"Thus far, only witnesses for the government have been called," and it will probably be many more months before witnesses for IBM are heard.

"But nothing that has happened so far has dimmed my belief that our corporation is correct," he said.

In response to press questions, Cary said capital expendistures for 1976 are expected to be about $2.4 billion.

IBM also expects to be on the General Services Administration schedule for 1977, he said, noting that this year IBM has negotiated contracts with agencies individually.

Profits were down in the U.S. and up overseas, he acknowledged, adding this was to be expected since the world is so much larger than the U.S.

Explaining IBM's response to last year's depressed business activity, Cary told stockholders the firm had to consolidate manufacturing locations, reassign personnel and reduce new hiring to a minimum.

About 3,800 people received new assignments within the company and 1,700 people were moved.

Cary referred briefly to a number of systems in IBM's new product lineup, adding that still in the laboratory is a transistor memory with 5 million bits per square inch.

This memory will be "faster and use less power" than any other existing IBM product, he said.

(Continued on Page 38)

Completely Distributed Systems Won't Appear Soon: Spangle

By Molly Upton
Of the CW Staff

BOSTON – Completely distributed systems are still largely experimental, and their implementation will be evolutionary rather than revolutionary, according to Clancy Spangle, president of Honeywell Information Systems (HIS).

"Within the industry, in the next few years we can expect to see more standard distributed system product offerings. We can expect to hear more talk about this 'wave of the future.'

"But we must remember it will be five years or more before distributed systems become a substantial part of the data processing mainstream," Spangle told the Honeywell-sponsored Minisystems '76 conference here recently.

"There are many challenges yet to be met. Software for completely distributed systems, for example, is largely in the design stage.

"Manufacturers must develop common communications protocols that will provide the user more flexibility in designing a system. And the protocols must meet industrywide standards that do not yet exist so they are not too restrictive for users," he said.

Spangle said he wasn't trying to paint a pessimistic picture for distributed systems, but did want to be realistic.

One of the key elements determining the success of distributed systems will be their flexibility, he said.

If the distributed systems can be more flexible than the large centralized systems, this would be a large impetus for their growth, he said. But the concept that distributed systems are more easily modified than large systems needs more work, he cautioned.

He defined a completely distributed system as one with processing and information storage resident within the various operating components of an organization

(Continued on Page 36)

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Adopting Each Other's Characteristics

HIS Head Sees Mini, Mainframe Dividing Line Blurring

By Molly Upton
Of the CW Staff

BOSTON – With the expanding role of the minicomputer, it will be more difficult to distinguish between minis and mainframes because each will adopt some characteristics of the other.

But minis will not completely replace traditional mainframes, Clancy Spangle, president of Honeywell Information Systems (HIS), told the Honeywell-sponsored Minisystems '76 conference here recently.

Such replacement is "just not realistic when I consider the size of the installed base and user investment," he observed, adding, "I believe we'll see another generation of large systems."

In the future, general-purpose systems "will incorporate more of the technology that has tended to be used first in minis. That technology will either be directly integrated or used as building blocks of general-purpose systems – front-end, peripheral and communications processors and terminal controllers," Spangle said.

"At the same time," he added, "we expect that, as mini manufacturers get more into the end-user-oriented markets, they will act more like mainframe manufacturers.

"They will be expected to provide more support and services, either directly or indirectly through systems houses. Their marketing programs will have to be re-oriented. Their businesses will necessarily become more complicated and involved as their need for financial and organizational resources grows.

"As some mini manufacturers have already discovered, this role is not an easy one to assume," he noted.

Price Erosion Smaller

Although Spangle said he sees price erosion in the OEM mini market, it will not be in the 15% to 20% range as in the recent past. Even if the processors and memory are cheaper, input/output is a major part of the system and that won't get as cheap as fast, he said.

The growth of minis is outpacing that of the mainframe area, but even so the mini base will account for 15% of the total by 1980, he said.

In 1976 the value of mini shipments is expected to increase about 35% over 1975 while the general-purpose market will be hard-pressed to achieve a 15% shipment value increase, he said.

"While the installed value of general-purpose computers is expected to increase at an annual rate of 11% to more than $90 billion by 1980, minicomputers will be growing at a strong 20% average annual rate.

"Their installed base will increase from about $5.4 billion in 1975 to nearly $15 billion in 1980," he said.

"While the greatest growth is occurring in the small and large areas, there is still a substantial market in medium systems," he said, observing HIS has booked its 400th double 64 system.

From 1975 to 1980, traditional mini applications will continue to form the bulk of the minicomputer shipments, "but their proportion will be decreasing," Spangle said.

"In the U.S. alone, we expect data monitoring and system control applications to account for close to $750 million, or nearly 40% of the mini shipments by the end of the decade. Last year they accounted for about $450 million, or about 50%," he said.

"Shipments for communications support applications are expected to stay around the 30% figure, but rising from 1975's $300 million to almost $600 million by 1979," he said.

"The remaining 30% of shipments is expected to go to the small business market, which will grow significantly as hardware costs decrease," he remarked.

"This market constituted about 20% of 1975 mini shipments, with a value of about $200 million. By 1979 its market share is expected to be valued in excess of $600 million."

At the low end of this market, the capabilities of minis will be enhanced by micros and micro-based computers.

"While there may be some displacement, micros will tend to be used for simple, dedicated tasks and minis will be required for more complex, general applications," he said.

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Distributed Systems Evolutionary: Spangle

(Continued from Page 35)

and with each application program accessible by programs at other sites.

Some of the same arguments proposed for the use of centralized systems, such as economics and organization control, are now being advanced for the employment of distributed processing, he said.

Looking at telecommunications costs, Spangle said the trade-off between distributed and central systems will be influenced to a large degree by carrier prices and policies. Much systems work needs to be done to determine the trade-offs, he indicated.

Some Resistance

The resistance to change will stem more from users' organizational factors than technological considerations, he predicted. "It is inevitable that there will be some resistance by centralized organizations for a decentralized structure," he said.

"It will take time for users' organizations to select those languages, applications packages and data base capabilities that they will utilize.

"New designs will have to be implemented for overall monitoring and control of the entire distributed system. New organizational controls will have to be implemented," Spangle said.

"Many questions will have to be answered regarding such things as the expertise required to run the overall network and the costs involved in decentralizing programming and operating functions to the user departments," he said.

Appeals Court Tells Experts to Appear at U.S. vs. IBM

By Edith Holmes
Of the CW Staff

NEW YORK – Two experts in the computer field who were unwilling to testify in the U.S. vs. IBM antitrust trial must appear in the district court hearing the case before the appellate court can act, according to a recent ruling from the U.S. Second Circuit Court of Appeals here.

The appeals court dismissed the request of Felix Kaufman and Frederick G. Withington to strike Judge David N. Edelstein's order that they testify [CW, March 22] on the grounds it does not yet have jurisdiction over the matter.

The appeals court also denied Kaufman's and Withington's request for a writ of mandamus.

The unwilling expert witnesses, called by the Justice Department and then subpoenaed, will risk contempt of court if they refuse to answer questions at the antitrust trial.

Kaufman, an accountant with 15 years experience in the computer industry, is employed by Coopers & Lybrand. Withington is an industry analyst with Arthur D. Little, Inc.

"The government is seeking the very core of my expertise, which I do not wish to provide and which I consider to be a proprietary asset available solely to my employer or to those for whom I wish to work," Withington told the appeals court.

In the majority opinion of the three-judge panel, Judge Henry J. Friendly wrote: "To clothe all such expert testimony with privilege solely on the basis that the expert owns his knowledge free of any testimonial easement would be to seal off too much evidence important to the just determination of disputes."

In a separate but concurring opinion, Judge Murray I. Gurfein advocated a case-by-case review of courts' ability to compel unwilling witnesses to testify "unless the federal rules of evidence can be amended adequately.

"A rule that experts may be called generally and required to attend might make the lives of some experts unbearable," he said.

The trip by Kaufman and Withington to the Second Circuit Court of Appeals came after Edelstein ordered them to make themselves available to testify.

Kaufman and Withington had asked Edelstein to rule that as experts they could not be compelled by a subpoena to appear in court in a case in which they have no interest, particularly when there are other experts in their fields who might just as easily be called.

The options open to Kaufman and Withington, if they choose not to answer questions at the trial, are to appeal directly to the Supreme Court, ask for a hearing by the full nine-judge panel of the Second Circuit Court of Appeals or go through contempt proceedings and appeal again to the Second Circuit's three-judge panel, according to observers.

Unbundling Seen Software Boost

(Continued from Page 35)

point in 1969, generating $600 million in revenues. This business then dropped to $400 million to $550 million in the early 1970s and came back up to $600 million in 1975," he said.

But rather than attribute this growth to increased competition in software following IBM's decision to price services and hardware separately, Welke indicated this industry's expansion was due to several factors, among them a shortage of good technicians and an Increasing reliance on software instead of hardware to improve system performance.

Independent software firms, such as Planning Research Corp., Computer Usage Corp., Systems Development Corp. and Computer Sciences Corp. (CSC), were actually established in the late 1950s, he said.

Informatics and Applied Data Research (ADR) came later – around 1962, he recalled.

Reasons for Growth

Two main forces contributed to the growth of a dozen independent software vendors around 1960: the work these firms were doing for computer manufacturers, primarily on operating systems, and the continuing shortage of people qualified in DP, Welke said.

In the mid-1960s, the development of IBM's 360 system gave impetus to independent software company development by making the industry that much more complex in hardware and software and so increasing the demand for services, he told the court.

Welke estimated 30% to 35% of the systems software for third-generation machines was written by independent software firms. CSC did considerable work for Univac, for example, as did ADR for Honeywell, he said.

Around 1967-68, the software industry "exploded" in its growth, according to Welke. Then running the *ICP Quarterly* directory out of his dining room, he counted 2,800 firms engaged in some form of software development.

This expansion occurred because financing was "unbelievably easy" to obtain, Welke said. He repeatedly stated the software business has few risks associated with it.

In the late 1960s, Welke said, there were no appreciable expenditures related to starting a software company: "All you needed then – or now – is a coding pad and a sharp pencil."

During this period, top technical people were attracted to the independent software firms rather than to user shops or to computer manufacturers. The independents offered technical challenges, better pay and stock options, Welke stated.

The economic situation in 1970 weeded out the marginally competitive companies, he said.

Asked whether there would be more independent suppliers of software today if IBM had unbundled before 1969, Welke said there are too many factors involved to permit his speculation.

He noted the flexibility of the current marketplace and the fact that ICP listed some 800 software product suppliers and 200 contract programming firms in 1975.

Some say the market will quadruple in five years; others say four major software product suppliers will be left – not one of them IBM, he said.

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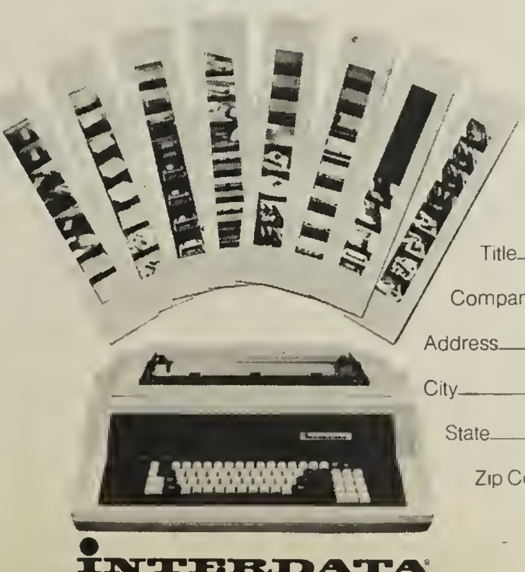

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BST

System/3 is a great computer. We make it better.

Payments by IBM Totaled $53,000, Stockholders Told

(Continued from Page 35)

Also still hatching is a computer language that would allow users to access a data bank using English instructions. The user will merely give an example of what type of information he wants without having to give precise instructions, he said.

The Satellite Business Systems venture will put the firm in head-to-head competition with AT&T, he said.

In response to a question from one stockholder, Cary acknowledged that customer approval of point-of-sale supermarket systems is "slower than we anticipated," but that the systems have great potential.

Stockholder Concerns

Stockholders who spoke up at the meeting were principally concerned about illegal political contributions, payoffs and doing business with South Africa.

The biggest brouhaha at the meeting arose between two rival church organizations. The Interfaith Center on Corporate Responsibility, represented by Timothy Smith, expressed concern over IBM's reluctance to cease doing business in South Africa.

In a resolution that would have ended IBM's activity in South Africa, Smith pointed out that AT&T and Polaroid have both agreed not to bid on systems supporting police and military functions.

"IBM has only one business criteria – profit," he said, noting that IBM has bid on the passbook system that keeps the apartheid system working.

Lester Kinsolving spoke in opposition to the resolution, which was defeated, asking the first group if its member churches turn away contributions from IBM employees.

The stockholders reelected to one-year terms the 20 members of the board of directors nominated in the proxy statement.

They also ratified the appointment of Price Waterhouse and Co. as IBM's auditor and approved two management proposals relating to employee stock purchases and an increase in the number of authorized shares of capital stock.

Two other stockholder proposals related to political contributions and outside counsel were defeated.

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CDC Head Cites Technotec

New Jobs Seen in Technology Exchange

PARIS – Massive numbers of jobs can be created through increased international cooperation in science and technology, according to William C. Norris, chairman and chief executive officer of Control Data Corp.

Solutions to the world's problems in energy, food, materials, education, health care and transportation could provide many new jobs, Norris told a news conference here recently.

"The answer lies in international cooperation to make better use of existing technology and be more efficient in developing new technology," he said.

CDC's worldwide computer-based service, Technotec, is helping to increase the exchange of technology, Norris claimed.

Technotec is a data base of technology described in a problem-oriented manner.

"Since Technotec was introduced eight months ago, over 50 organizations have either contributed technology descriptions to be stored in our computers or searched the data base or done both," he said.

'Best of Both Worlds'

Small companies have an important role in creating new jobs through technology exchange "because history shows small companies are better innovators than large companies," Norris said.

"However, we can have the best of both worlds with small and large companies working together with a work division best suited to each," he added.

Joint ventures are "probably the most appropriate approach" to long-term relationships between small and large organizations," Norris believes.

"A large company might have several hundred small independent companies associated with it, each of which is free to innovate in its own proven field and in its own individualistic way," he said.

CDC has begun a program to put all its technology suitable for exchange with others or for sale into Technotec and is encouraging other organizations to make use of it.

In addition to facilitating the transfer of existing technology, Technotec can assist in developing new technology more effectively by identifying opportunities for cooperation between different countries or between organizations within countries, he observed.

Seminar to Focus On Marketing

NEW YORK – A two-day seminar on "Marketing Strategies for Selling to the Telecommunications Industry" will be held May 17-18 at the Barbizon-Plaza Hotel here and will feature 18 speakers. The seminar is sponsored by Frost & Sullivan, Inc., in conjunction with Harry Newton, consultant, and Norm Brust, director of client services at Network Analysis Corp.

Topics include a look at the major telecommunications markets, an evaluation of monopolistic situations, the regulatory arena and selling to various segments within the industry.

Also, speakers will examine what the major suppliers such as IBM and AT&T are plannning and how independent suppliers fit in.

Videotapes of the sessions will be displayed at a conference in Los Angeles May 20-21.

The fee for the New York session is $375 and for Los Angeles $325 for the first attendee from a firm. Others receive a 20% discount.

For further information write Bob Sanzo at Frost & Sullivan, 106 Fulton St., New York, N.Y. 10038.

Contract Negotiator Raises Retainer Fee

WINTER PARK, Fla. – International Computer Negotiations (ICN), a firm that assists computer users in negotiating contracts with mainframe vendors, has announced an increase in its annual retainer fee.

The retainer fee paid by clients is deductible from incentive fees ICN charges for producing unexpected savings.

Fees vary depending upon the computer manufacturer, type of equipment, structure of transaction and stage of negotiation when ICN is engaged, Joe Auer, ICN president, explained.

For a system valued at $500,000 to $1 million, ICN charges a minimum annual retainer of $3,500 for 30 hours.

ICN can be reached through P.O. Box 364, Winter Park, Fla. 32790.

POSITION ANNOUNCEMENTS

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The Data Processing Department welcomes applications for a faculty position available September 7, 1976. A Bachelors degree required. Masters preferred. Three years business data processing experience is required. Rank and salary dependent upon qualifications. Requires strong interest in undergraduate instruction and ability to teach courses in the following areas: Systems Analysis, Programming Languages, Teleprocessing, and Data Base Management. Send complete resume to Professor Stuart J. Travis, Head, Data Processing Department, Ferris State College, Big Rapids, MI 49307

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Interested applicants should send a detailed resume, full salary information, and availability data to: Charles J. Lewis, Manager, Database Services

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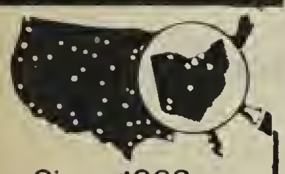

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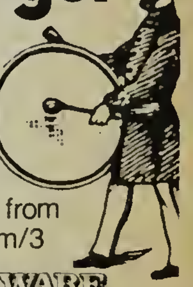

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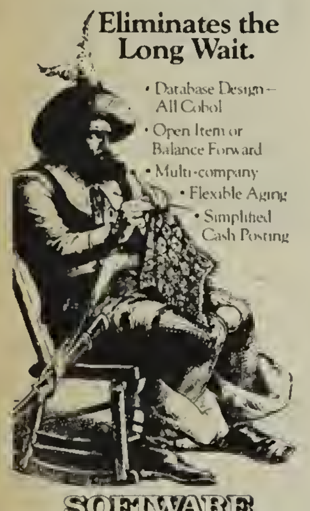

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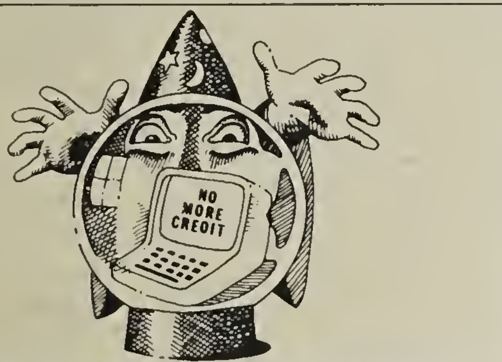

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Centronics Scores Record Periods

HUDSON, N.H. – Centronics Data Computer Corp. scored a record third quarter and nine months for both earnings and revenues.

For the quarter, earnings rose to over $2.9 million or 61 cents a share compared with over $1.9 million or 41 cents a share in the same period last year.

Revenues rose by more than 26% to $13.5 million compared with $10.7 million in the year-ago quarter.

For the nine months, Centronics earned nearly $7.8 million or $1.61 a share compared with nearly $5.6 million or $1.17 a share.

Revenues rose to $37.9 million compared with almost $31 million in the same period last year.

CA's Third Quarter Earnings Triple

IRVINE, Calif. – Computer Automation, Inc. (CA) reported third-quarter earnings tripled over those of a year ago while nine-month results more than doubled.

During the quarter, the firm earned $841,500 or 43 cents a share compared with $277,042 or 17 cents a share in the same period last year.

Revenues rose 49% to nearly $8 million compared with $5.4 million in the year-ago quarter.

For the nine months, earnings rose to $2.2 million or $1.14 a share compared with $792,943 or 48 cents a share in the same 1975 period.

Revenues grew to $22.3 million compared with $15.6 million in the same period last year.

President David H. Methvin attributed the quarter's record performance to a combination of factors, including the continuing economic upturn and the expansion of markets for the company's lines of low-priced minicomputers, as well as the automated production testing systems sold to manufacturers of printed circuit modules.

A new factor in the company's performance was the first revenue derived from a domestic customer for the Syfa System, the company's small business computer system.

The company believes that the customer, a large hospital organization, will use many of the Syfa systems throughout its network of hospitals, according to Methvin.

ADP Posts Improvements in Sales; Net Income Also Up in Three Months

CLIFTON, N.J. – Automatic Data Processing, Inc. (ADP) achieved record revenues and earnings in the third quarter.

Revenues rose to $49.2 million in the third quarter ended March 31, compared with $39.7 million last year.

Earnings were $4.6 million or 64 cents a share compared with $3.4 million or 48 cents a share last year.

Last year's results were restated for the acquisition of Cyphernetics Corp. on a pooling-of-interests transaction.

"Third-quarter results were better than planned, with the operations of all major segments of the company contributing to the strong performance," President Frank R. Lautenberg said.

"While the Financial Data Services Division benefited from record Wall Street trading volume during the quarter, and the Dealer Services Division was helped by the conversion of some minicomputer leases to outright sales, the quarter was adversely affected by losses in the non-DP subsidiaries," he said.

"In view of the year-to-date results and our expectations for the fourth quarter, we expect the improvement in earnings per share for fiscal 1976 to be in excess of 25%," Lautenberg said.

During the nine months, earnings rose to $12.5 million or $1.78 a share compared with $9.7 million or $1.39 a share in the same period last year.

Revenues climbed to $135.6 million compared with $112.5 million in the year-ago period.

Calcomp Shows Loss in Nine Months

ANAHEIM, Calif. – Although California Computer Products, Inc. (Calcomp) chalked up its second consecutive profitable quarter in the third period, the results were not enough to counterbalance a loss for the nine months.

For the quarter, the firm earned $356,000 or 11 cents a share compared with a loss of $4.6 million or $1.44 a share in the same period last year. Revenues rose to $30.7 million compared with $26.2 million.

During the nine months, the loss was diminished to $2.7 million or 82 cents a share compared with $3.6 million or $1.10 a share in the year-ago period.

Revenues dropped to $88.8 million compared with nearly $91 million in the same period last year.

President Lester L. Kilpatrick said, "The continued improvement in profits reflect cost reductions and increased productivity. Outlook for the fourth quarter is good. I expect the fourth quarter to show an increase in both revenues and profits."

Earnings Reports

APPLIED DATA RESEARCH
Year Ended Dec. 31

	1975	a1974
Shr Ernd	$.36	$.04
Revenue	12,738,765	10,589,798
Disc Op	b(131,840)	(197,010)
dSpec Cred	207,000	271,000
eSpec Item	.....	(411,000)
Earnings	431,736	49,281

a-Restated to reflect discontinued operations. b-Includes $17,949 gain on dispostion of time-sharing division. d-Primarily from a tax-loss carryforward. e-Cumulative effect on prior years of accounting change.

ANALOG DEVICES
Three Months Ended Jan. 31

	1976	1975
Shr Ernd	$.28	$.18
Revenue	8,568,000	7,289,000
Earnings	403,000	246,000

CAMBRIDGE MEMORIES
Three Months Ended Feb. 28

	1976	1975
Shr Ernd	$.03	$.03
Revenue	6,859,000	5,233,000
Earnings	54,000	46,000
6 Mo Shr	.....	.09
Revenue	11,577,000	10,903,000
Earnings	(604,000)	148,000

COMPUSCAN
Three Months Ended Feb. 29

	1976	1975
Shr Ernd	$.18	$.24
Revenue	3,474,000	2,756,000
Tax Cred	.....	151,000
Earnings	301,000	369,000
9 Mo Shr	.59	.59
Revenue	9,419,000	7,280,000
Tax Cred	251,000	371,000
Earnings	971,000	892,000

COMPU-SERV NETWORK
Year Ended Dec. 31

	1975	1974
Shr Ernd	$.67	$1.23
Revenue	8,463,144	7,224,982
Tax Cred	.....	56,000
Earnings	354,510	652,708

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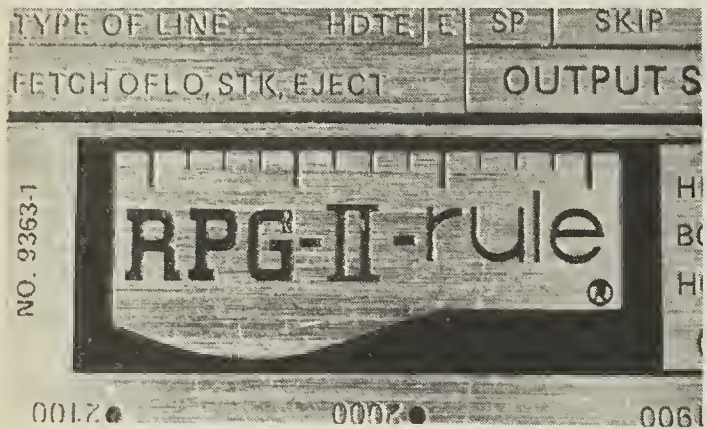

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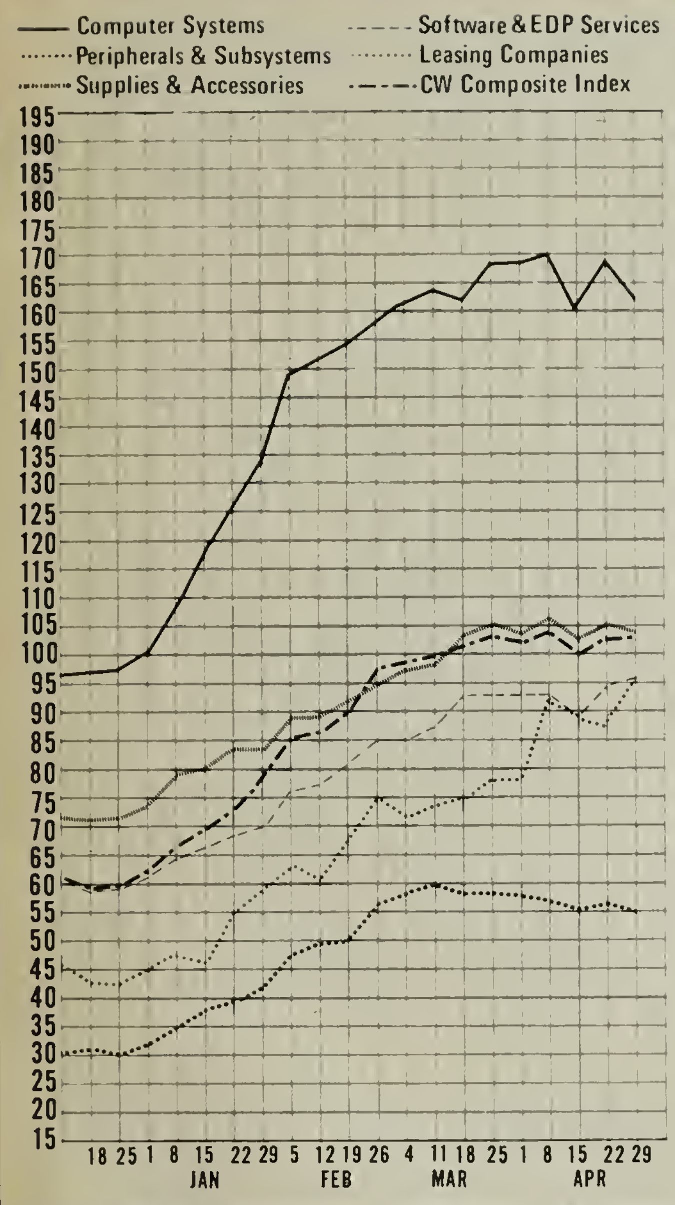
COMPUTERWORLD Computer Stocks Trading Indexes



Earnings Reports

CODEX
Three Months Ended Dec. 31

	1975	1974
Shr Ernd	$.28	$.73
Revenue	4,884,000	6,092,000
Earnings	444,000	1,077,000

COMPUDYNE
Three Months Ended Dec. 31

	1975	1974
Shr Ernd	$.04	$.02
Revenue	9,520,105	10,134,962
Earnings	177,813	132,782

APPLIED DEVICES
Year Ended Oct. 31

	a1975	1974
Shr Ernd	$.42	$.31
Revenue	20,106,000	14,452,000
Tax Cred	775,000	580,000
Earnings	1,602,000	1,142,000

a-Includes results of Datatrol, Inc., acquired March 4, 1975.

COMPUTER PRODUCTS
Year Ended Dec. 26

	1975	1974
Shr Ernd	$.23	$.19
Revenue	4,451,223	4,018,481
Earnings	264,618	214,969

CONRAC
Year Ended Dec. 31

	1975	1974
Shr Ernd	$2.60	$2.32
Revenue	90,427,000	81,129,000
Earnings	3,503,000	3,093,000
3 Mo Shr	.78	.69
Revenue	25,698,000	20,621,000
Earnings	1,050,000	912,000

MACRODATA
Year Ended Dec. 31

	1975	1974
Shr Ernd	.....	$.57
Revenue	$8,618,904	11,719,910
Earnings	(2,280,587)	955,861

MEDICAL COMPUTER SYSTEMS
Year Ended Dec. 31

	1975	1974
Shr Ernd	$.56	$.43
Revenue	7,375,185	6,171,712
Tax Cred	701,700	559,334
Earnings	1,516,705	1,178,819
3 Mo Shr	.16	.10
Revenue	1,980,995	1,659,636
Tax Cred	190,700	137,334
Earnings	431,203	287,992

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TRADE*QUOTES

Computerworld Stock Trading Summary

CLOSING PRICES WEDNESDAY, APRIL 28, 1976

All statistics compiled, computed and formatted by
TRADE★QUOTES, INC.
Cambridge, Mass. 02139

COMPUTER SYSTEMS

EXCH		PRICE 1975-76 RANGE (1)	CLOSE APR 28 1976	WEEK NET CHNGE	WEEK PCT CHNGE
N	BURROUGHS CORP	62-109	105 3/8	-2 1/4	-2.0
O	COMPUTER AUTOMATION	2- 19	16 5/8	- 7/8	-5.0
N	CONTROL DATA CORP	11- 27	22 3/4	-1 7/8	-7.6
N	DATA GENERAL CORP	10- 60	57 1/2	-1 1/2	-2.5
O	DATAPOINT CORP	6- 41	40	+2 1/4	+5.9
O	DIGITAL COMP CONTROL	1- 4	3 3/8	+ 3/8	+12.5
N	DIGITAL EQUIPMENT	46-181	178 1/4	-3	-1.6
N	ELECTRONIC ASSOC.	2- 5	3 7/8	+ 1/8	+3.3
A	ELECTRONIC ENGINEER.	5- 16	14 7/8	-1	-6.2
A	FOXBORO	23- 42	37 1/4	+1 1/8	+3.1
O	GENERAL AUTOMATION	4- 14	10	-1 1/8	-10.1
O	GRI COMPUTER CORP	1- 1	1/2	- 1/4	-33.3
N	HEWLETT-PACKARD CO	58-120	110 3/4	-4 3/4	-4.1
N	HONEYWELL INC	22- 56	45 1/4	-1 7/8	-3.9
N	IBM	158-272	256	-4 1/2	-1.7
O	MANAGEMENT ASSIST	1- 3	2 1/8	- 3/8	-15.0
O	MEMOREX	1- 33	31	-1 1/4	-3.8
O	MICRODATA CORP	2- 26	21 3/4	-1 3/4	-7.4
O	MODULAR COMPUTER SYS	5- 19	9 1/2	- 1/4	-2.5
N	NCR	15- 39	26 3/8	-1 5/8	-5.8
O	PRIME COMPUTER INC	2- 11	9 1/2	- 1/4	-2.5
N	PERKIN-ELMER	16- 30	21 3/8	-3 5/8	-14.5
N	RAYTHEON CO	26- 59	52 1/2	- 1/2	-0.9
N	SPERRY RAND	26- 50	48	+ 1/8	+0.2
O	SYCOR INC	5- 31	27	-1	-3.5
A	SYSTEMS ENG. LABS	1- 10	8 7/8	0	0.0
N	VARIAN ASSOCIATES	7- 18	15	- 5/8	-4.0
A	WANG LABS.	7- 20	13 3/8	0	0.0

LEASING COMPANIES

EXCH		1975-76 RANGE (1)	CLOSE APR 28 1976	WEEK NET CHNGE	WEEK PCT CHNGE
O	COMDISCO INC	1- 10	8 1/2	+ 1/4	+3.0
A	COMMERCE GROUP CORP	2- 4	2 7/8	+ 3/8	+15.0
A	COMPUTER INVSTRS GRP	1- 3	1 3/4	- 1/4	-12.5
M	DATRONIC RENTAL	0- 1	3/4	0	0.0
A	DCL INC	0- 1	3/4	+	+9.0
N	DPF INC	3- 7	6	0	0.0
O	EDP RESOURCES	1- 2	1	0	0.0
A	GREYHOUND COMPUTER	2- 7	7 1/4	+2 3/8	+48.7
N	ITEL	3- 13	11 7/8	- 3/4	-5.9
N	LEASCO CORP	4- 14	12 1/8	- 5/8	-4.9
O	LEASPAC CORP	0- 1	1/4	+ 1/8	+100.0
O	LECTRO MGT INC	1- 1	1/8	0	0.0
O	NRG INC	0- 4	7/8	0	0.0
A	PIONEER TEX CORP	2- 9	7 3/8	+ 1/8	+1.7
A	ROCKWOOD COMPUTER	1- 1	1/8	0	0.0
N	U.S. LEASING	7- 14	11	- 1/8	-1.1

EXCH: N=NEW YORK; A=AMERICAN; P=PHIL-BALT-WASH
L=NATIONAL; M=MIDWEST; O=OVER-THE-COUNTER
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SOFTWARE & EDP SERVICES

EXCH		PRICE 1975-76 RANGE (1)	CLOSE APR 28 1976	WEEK NET CHNGE	WEEK PCT CHNGE
O	ADVANCED COMP TECH	1- 2	1 3/8	- 1/4	-15.3
A	APPLIED DATA RES.	1- 10	2 7/8	+ 1/8	+4.5
N	AUTOMATIC DATA PROC	29- 67	66 1/2	+1 7/8	+2.9
O	BRANDON APPLIED SYST	1- 1	1/8	0	0.0
O	COLEMAN AMERICAN COS	4- 6	4 1/8	0	0.0
O	COMPUTER DIMENSIONS	2- 7	6	-1	-14.2
O	COMP ELECTION SYSTMS	3- 8	8 1/4	+2	+32.0
O	COMPUTER HORIZONS	1- 1	1 3/4	0	0.0
O	COMPUTER NETWORK	1- 6	5 3/8	0	0.0
N	COMPUTER SCIENCES	2- 8	6 5/8	+ 1/8	+1.9
O	COMPUTER TASK GROUP	1- 1	1	0	0.0
O	COMPUTER USAGE	2- 6	3 5/8	+ 1/8	+3.5
O	COMSHARE	2- 7	6 1/2	+2 1/4	+52.9
O	DATATAB	1- 2	1	+ 1/8	+14.2
A	ELECT COMP PROG	1- 1	1/8	0	0.0
N	ELECTRONIC DATA SYS.	11- 28	12 1/2	- 7/8	-6.5
O	INFONATIONAL INC	1- 1	1/8	0	0.0
O	IPS COMPUTER MARKET.	1- 1	1 1/8	+ 1/8	+12.5
O	KEANE ASSOCIATES	2- 3	3 1/8	0	0.0
O	KEYDATA CORP	2- 5	2 7/8	0	0.0
O	LOGICON	3- 5	4	0	0.0
A	MANAGEMENT DATA	1- 3	2 1/2	0	0.0
A	NATIONAL CSS INC	6- 25	20 1/2	- 1/4	-1.2
O	NATIONAL COMPUTER CO	1- 1	1/8	0	0.0
A	ON LINE SYSTEMS INC	8- 22	20	+1	+5.2
N	PLANNING RESEARCH	2- 6	3 1/2	- 1/4	-6.6
O	PROGRAMMING & SYS	1- 1	1/2	0	0.0
O	RAPIDATA INC	2- 5	3 1/8	- 1/4	-7.4
O	REYNOLDS & REYNOLD	10- 24	17 3/4	0	0.0
O	SCIENTIFIC COMPUTERS	1- 1	3/4	0	0.0
O	SIMPLICITY COMPUTER	1- 1	1	0	0.0
O	TYMSHARE INC	7- 28	25 1/2	- 1/8	-0.4
A	URS SYSTEMS	2- 5	4	+ 1/4	+6.6
N	WYLY CORP	2- 7	4 3/4	- 1/4	-5.0

PERIPHERALS & SUBSYSTEMS

EXCH		1975-76 RANGE (1)	CLOSE APR 28 1976	WEEK NET CHNGE	WEEK PCT CHNGE
N	ADDRESSOGRAPH-MULT	4- 13	9 3/8	- 5/8	-6.2
O	ADVANCED MEMORY SYS	1- 10	7 5/8	- 3/8	-4.6
N	AMPEX CORP	3- 8	7	- 1/2	-6.6
O	ANDERSON JACOBSON	1- 4	3 1/8	+ 1/8	+4.1
O	BEEHIVE MEDICAL ELEC	1- 6	5 1/4	+ 5/8	+13.5
A	BOLT,BERANEK & NEW	5- 13	7 3/4	- 1/8	-1.5
N	BUNKER-RAMO	4- 8	5 3/4	- 1/4	-4.1
A	CALCOMP	3- 7	4 1/2	- 5/8	-12.1
O	CAMBRIDGE MEMORIES	1- 6	4 3/8	0	0.0
N	CENTRONICS DATA COMP	7- 35	35 1/8	+2	+6.0
O	CODEX CORP	15- 42	33 1/2	-4 1/2	-11.8
O	COGNITRONICS	1- 2	1	- 1/8	-11.1
O	COMPUTER COMMUN.	1- 5	4 7/8	+ 3/8	+8.3
O	COMPUTER CONSOLES	3- 7	6	0	0.0
A	COMPUTER EQUIPMENT	1- 3	2	0	0.0
O	COMPUTER TRANSCEIVER	1- 2	1 1/2	+ 1/4	+20.0
O	COMTEN	2- 9	7 3/4	- 1/8	-1.5
N	CONRAC CORP	12- 30	23 5/8	- 3/8	-1.5
O	DATA ACCESS SYSTEMS	1- 3	3	+ 3/4	+33.3
O	DATA 100	5- 16	10 5/8	- 1/4	-2.2
A	DATA PRODUCTS CORP	2- 11	10 3/8	- 1/8	-1.1
O	DATA TECHNOLOGY	1- 3	1 3/4	- 1/4	-12.5
O	DATUM INC	1- 2	1 3/4	- 3/8	-17.6
O	DECISION DATA COMPUT	2- 7	2	- 3/8	-15.7
O	DELTA DATA SYSTEMS	1- 1	3/8	0	0.0
O	DI/AN CONTROLS	1- 1	1	0	0.0
N	ELECTRONIC M & M	1- 3	2 3/4	0	0.0
O	FABRI-TEK	1- 1	3/4	0	0.0
O	GENERAL COMPUTER SYS	1- 2	1 1/4	0	0.0
N	HAZELTINE CORP	3- 12	8 3/4	- 7/8	-9.0
N	HARRIS CORP	18- 47	44 1/8	-1 1/8	-2.4
A	INCOTERM CORP	3- 20	14 3/8	- 3/4	-4.9
O	INFOREX INC	2- 7	5 3/8	- 1/4	-4.4
O	INFORMATION INTL INC	8- 18	14	- 1/4	-1.7
O	INTEL CORP	21-109	73	-2	-2.6
A	LUNDY ELECTRONICS	3- 7	4 7/8	+ 1/8	+2.6
O	MSI DATA CORP	3- 10	6 1/8	+ 1/8	+2.0
A	MILGO ELECTRONICS	8- 24	15 7/8	- 5/8	-3.7
N	MOHAWK DATA SCI	1- 7	5 3/8	- 1/4	-4.4
O	OPTICAL SCANNING	1- 3	1/2	+ 1/8	+33.3
O	PENRIL CORP	1- 2	2 1/2	0	0.0
A	PERTEC CORP	2- 8	6 1/4	- 1/4	-3.8
A	POTTER INSTRUMENT	2- 2	1 3/4	0	0.0
O	PRECISION INST.	9- 10	9	0	0.0
O	QUANTOR CORP	2- 6	4 5/8	+ 5/8	+15.6
O	RECOGNITION EQUIP	2- 11	9 1/4	- 1/4	-2.6
N	SANDERS ASSOCIATES	3- 11	10 1/8	- 1/8	-1.2
O	SCAN DATA	1- 4	2 1/2	+ 1/8	+5.2
O	STORAGE TECHNOLOGY	6- 17	10 5/8	- 5/8	-5.5
O	T BAR INC	3- 10	6 3/8	+ 1/8	+2.0
O	TALLY CORP.	1- 6	4 3/4	0	0.0
O	TEC INC	1- 5	4 1/2	0	0.0
N	TEKTRONIX INC	18- 60	58 5/8	- 3/8	-0.6
N	TELEX	1- 5	3 5/8	0	0.0
O	WANGCO INC	4- 22	17 1/2	-2 3/4	-13.5
O	WILTEK INC	1- 4	2	0	0.0

SUPPLIES & ACCESSORIES

EXCH		1975-76 RANGE (1)	CLOSE APR 28 1976	WEEK NET CHNGE	WEEK PCT CHNGE
O	ADVANCED SYSTEMS INC	1- 4	3 1/2	0	0.0
O	BALTIMORE BUS FORMS	4- 5	4 1/2	0	0.0
A	BARRY WRIGHT	5- 10	8 3/8	- 1/8	-1.4
O	CYBERMATICS INC	0- 1	5/8	0	0.0
A	DATA DOCUMENTS	29- 42	36 3/4	+ 3/8	+1.0
O	DUPLEX PRODUCTS INC	12- 25	18 3/8	- 5/8	-3.2
N	ENNIS BUS. FORMS	5- 8	6 5/8	- 1/8	-1.8
O	GRAHAM MAGNETICS	5- 13	11 1/4	- 1/2	-4.2
O	GRAPHIC CONTROLS	8- 21	18 1/4	+1 1/2	+8.9
N	3M COMPANY	43- 68	62 3/8	-1 1/8	-1.7
O	MOORE CORP LTD	39- 51	47 3/4	0	0.0
N	NASHUA CORP	9- 22	15 7/8	+ 5/8	+4.0
O	STANDARD REGISTER	11- 20	16 1/4	-1	-5.7
O	TAB PRODUCTS CO	4- 8	7	0	0.0
N	UARCO	17- 25	24	- 1/2	-2.0
O	VANIER GRAPHICS CORP	4- 8	6 3/4	- 3/8	-5.2
A	WABASH MAGNETICS	3- 8	6 5/8	- 1/8	-1.8
N	WALLACE BUS FORMS	15- 25	22 1/4	0	0.0

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